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1960

ISSUED EVERY FIVE YEARS

THIRD EDITION

1960

kept up-to-date by Annual Supplements

BOCA Abridged **BUILDING CODE**



FOUNDED 1915

BUILDING OFFICIALS
CONFERENCE of AMERICA, Inc.

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SECOND PRINTING, MARCH, 1962

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OWL PRINTING COMPANY — CHICAGO, ILLINOIS

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SOLE AGENTS: THE COMPANY — CHICAGO, ILLINOIS

The program and work of the

BUILDING OFFICIALS CONFERENCE OF AMERICA, INC.

is dedicated to

- the promotion of public safety against the hazards to life and health incident to the construction and use of buildings;
- the advancement of sound methods of building construction;
- the establishment of requirements for prevention of the incidence and spread of fire,
- the relief of the public and industry from the confusion and uncertainty of conflicting building laws;
- the encouragement, enlightenment, and advancement of building officials;
- the furtherance of civic pride and community well being; and
- the substantial growth of every municipality in America.

* * *

Many communities lack adequate building regulations because of the time and the cost involved in the preparation of a building code and the effort required to keep it up-to-date. As a public service, the Building Officials Conference of America, Inc., has prepared an ABRIDGED BUILDING CODE designed for the needs of those communities which are predominantly residential in character, and a BASIC BUILDING CODE which is adapted to the needs of larger communities. These codes are offered to any community without royalty or charge for their use or the use of subsequent changes. Assistance is also available to any community in organizing a program to secure the benefits resulting from the adoption of these modern, comprehensive, workable codes.

cont. 11/27/66

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PREFACE
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This third edition of the ABRIDGED BUILDING CODE of the Building Officials Conference of America, Inc., represents the Code as originally issued with changes which have been approved since the first edition was published in 1934. It is the same as the 1955 edition with the 1959 Addendum and 1960 Annual Supplements previously available.

This Code is designed specifically to meet the needs of those communities which are predominantly residential in character and in which buildings generally are not more than three stories in height. Since it contains requirements for the type of commercial and community buildings usually incidental to the civic life of such communities, it is generally sufficient for their needs, although large projects and buildings which in-
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DEDICATION

The ABRIDGED BUILDING CODE, issued by the Building Officials Conference of America, Inc., is dedicated to the many Building Officials from all parts of the United States and Canada, and the Engineers, Architects, Technicians, representatives of Builders, Contractors, Material Producers, Trade Associations and others who collaborated in its preparation; and to the members of the Code Changes Committee and Subcommittees who have participated in the important work of keeping the code abreast of new developments in construction technology.

These men have given unstintingly of their time and effort to produce and maintain this performance type Building Code which has been widely recognized and adopted by many communities.

Proposed changes are carefully reviewed by committees, discussed in a public hearing and acted upon by public officials in an open meeting of the organization. Approved changes are published annually in supplements to the code in convenient form for adoption by local governments. A new edition of the code, containing all approved changes since the previous edition, is issued every five years.

The Abridged Code regulations are supplemented by a Material Approval Service which assists the Building Official in evaluating new materials and procedures and enables manufacturers of building products to standardize the presentation of data relating to their products to both Building Officials and builders or contractors. Material approvals are issued only after a thorough analysis of reports of tests made under standard procedures establishes that the product will perform satisfactorily under conditions of actual use.

The Building Officials Conference of America, Inc., further assists the Building Official and the community through plan examination services for the review of complicated plans and by consultation and advisory services to assist in determining the application of the Abridged Code to local conditions.

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While the ABRIDGED BUILDING CODE is a performance code, the requirements are stated in it somewhat differently than in the BASIC BUILDING CODE in recognition of the conditions usually found in the communities it is designed to serve. In general this code anticipates the use of ordinary stock materials combined by practical methods rather than identified materials used under comprehensive engineering design. Full provision is made, however, for the advantages of engineering principles where they may be used. Because of this the ABRIDGED CODE may be used in conjunction with the BASIC CODE for buildings coming within its scope as defined in section 100.

This Code is kept up-to-date through the review of changes proposed by Building Officials, the technical staff of the organization, industry or other interested persons or organizations. Proposed changes are carefully reviewed by committees, discussed in a public hearing and acted upon by public officials in an open meeting of the organization. Approved changes are published annually in supplements to the code in convenient form for adoption by local governments. A new edition of the code, containing all approved changes since the previous edition, is issued every five years.

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EDITORIAL NOTE

In order to make the Abridged Building Code agree with changes approved for the Basic Building Code, where applicable, some editorial changes not appearing in the Supplements to the Abridged Code have been included in this edition. For the benefit of any who may be concerned, these are listed as follows:

- Appendix A** Revised and expanded to correspond to Appendix A of the Basic Building Code.
- Appendix B-1** Revised and expanded to correspond to Appendix B of the Basic Building Code.
- Appendix B-2** Added to correspond to Appendix G of the Basic Building Code.
- Appendix C** The Fire Resistance Ratings for Assemblies of Common Materials has been transferred to a separate publication because these listings are applicable to both the Basic Building Code, and the Abridged Building Code. A new Appendix C, corresponding with Appendix C of the Basic Building Code listing accepted material standards, has been substituted.
- Appendix F** Revised to correspond to expansion of Appendix L of the Basic Building Code.

EDITORIAL CORRECTIONS—Second Printing, March 1962

The following changes, corrections, omissions or additions have been made in the text of the Abridged Building Code in this second printing of the third edition:

Page 12. Sec. 104.61—7th line the word "Basic" to be deleted.

Page 18. Sec. 107.27—duplicate text deleted.

Page 112. Appendix B-1—the following standard inserted under heading

"WOOD AND WOOD PRODUCTS":

Maximum Span for Joists and Rafters in Residential Construction.....NLMA—1960

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BOCA Abridged Building Code

SECTION 100.0. SCOPE

The provisions of this code shall govern the design, construction, alteration, demolition and moving of all buildings and structures specified in section 100.2 and their service equipment. They shall apply to existing and proposed buildings as herein provided except as such matters may be otherwise prescribed in the statutes of the State of [name of state] or in the municipal charter or other local ordinance of [name of municipality].

100.1. Title.—These regulations shall be known and cited as “The Building Code of [name of municipality], State of [name of state]”; and shall be construed to secure their expressed intent and to insure public safety, health and welfare insofar as they are dependent upon building construction.

100.2. Application of ABC.—All buildings and structures hereafter erected, altered, repaired, moved or demolished that are used or designed to be used for the purposes herein defined shall comply in full with the requirements of this code, including: one- and two-family and multi-family dwellings which are not more than three (3) stories nor more than forty (40) feet in height; private garages and other buildings accessory to dwellings not more than one and one-half (1½) stories nor more than fifteen (15) feet in height; and business, assembly, institutional and municipal buildings which are not more than three (3) stories nor more than forty (40) feet in height, other than buildings for high hazard uses unless specifically provided for in this code.

100.3. Application of Basic Code—All buildings and structures which involve the use of structural steel and reinforced concrete framing; heavy timber construction; roof trusses with spans more than twenty-five (25) feet, not including trussed roof rafters; and all other buildings and structures not specified in section 100.2 shall conform to all applicable requirements of the Basic Code; except that the incidental use of steel beams, girders, columns and hangers and reinforced concrete slabs and walls shall be permitted under the provisions of this code.

100.4. Compliance with Basic Building Code.—The Basic Building Code is hereby made a part of this code in respect to the matters specified in section 100.3. The plans and specifications for such structures may be referred to the Structural Bureau of the Building Officials Conference for analysis, report and recommendation as to their structural, fire and sanitary safety, and adequacy of exits for the intended use and occupancy. Three official copies of the Basic Building Code shall be maintained on file in the office of the building official for the use and guidance of the public.

100.5. Zoning Laws and Other Statutes.—Except as may be specifically provided herein, no provisions of the zoning law or any other legal statutes pertaining to the location, use or construction of building shall be nullified by the provisions of this code; but in any case, the most rigid requirements shall control the construction, equipment or location of the building or structure. All existing local ordinances or parts of ordinances in conflict with the provisions of this code are hereby repealed. Whenever state

statutes require the approval of special use group buildings, including among others factories, schools and multi-family dwellings, the approval of such authorities shall accompany the application for a permit as required in section 104.2.

SECTION 101.0. DEFINITIONS

In the interpretation of this code, all words other than the terms herein specifically defined shall have their ordinarily accepted meanings as implied by the context or as customarily used in the construction industry.

ABC. The Abridged Building Code promulgated by the Building Officials Conference of America, Inc.

accepted engineering practice. That which conforms to accepted principles, tests or standards of nationally recognized technical or scientific authorities.

alley. A secondary thoroughfare less than thirty (30) feet in width dedicated for the public use of vehicles and pedestrians affording access to abutting property.

alteration. As applied to a building or structure, means a change or a re-arrangement in the structural parts or in the exit facilities; or an enlargement, whether by extending on a side or by increasing in height; or the moving from one location or position to another.

apartment house. (See dwellings.)

approved. Approved by the building official or other authority having jurisdiction.

approved rules. The legally adopted rules of the building official or of a recognized authoritative agency.

attic. The space between the ceiling beams of the top habitable story and the roof rafters.

—habitable attic. A habitable attic is an attic which has a stairway as a means of access and egress and in which the ceiling area at a height of seven and one-third ($7\frac{1}{3}$) feet above the attic floor is not more than one-third ($\frac{1}{3}$) the area of the floor next below.

basement. A portion of the building partly underground, but having less than half its clear height below the average grade of the adjoining ground. (See cellar.)

BBC. The Basic Building Code promulgated by the Building Officials Conference of America, Inc.

boarding house. (See dwellings.)

building. (See structure.) A structure enclosed within exterior walls or fire walls, built, erected and framed of component structural parts, designed for the housing, shelter, enclosure and support of individuals, animals or property of any kind.

building line. The line, established by law, beyond which a building shall not extend, except as specifically provided by law.

building official. The officer or other designated authority charged with the administration and enforcement of this code, or his duly authorized representative.

building service equipment. The mechanical, electrical or elevator equipment, including piping, wiring, fixtures and other accessories which

provide sanitation, lighting, heating, ventilation, fire fighting and transportation facilities essential for the habitable occupancy of the building or structure for its designated use and occupancy.

cellar. The portion of the building partly underground, having half or more than half of its clear height below the average grade of the adjoining ground.

certificate of use and occupancy. The certificate issued by the building official permitting the occupation and use of a building in accordance with the approved plans and specifications which certifies compliance with the provisions of law for the use and occupancy of the building in its several parts together with any special stipulations or conditions of the building permit.

change of use. An alteration of a building or structure by change of use, heretofore existing, to a new use group which imposes other special provisions of law governing building construction, equipment or exits.

chimney. A primarily vertical enclosure containing one or more passageways.

—**factory-built chimney.** A chimney that is factory made, listed by an accredited authoritative agency, for venting gas appliances, gas incinerators, and solid or liquid fuel burning appliances.

—**masonry chimney.** A field constructed chimney built in accordance with nationally recognized codes or standards.

—**metal chimney.** A chimney made of metal of adequate thickness, galvanized or painted unless suitably corrosion-resistant, properly welded or riveted and built in accordance with nationally recognized codes or standards.

chimney connector. A pipe or breaching which connects the heating appliance to the chimney.

corner lot. (See lot-corner.)

court. An open, uncovered, unoccupied space partially or wholly surrounded by the walls of a structure.

—**inner.** A court surrounded on all sides by the exterior walls of a structure or by such walls and an interior lot line.

—**outer.** A court having at least one side thereof opening on to a street, alley or yard or other permanent open space.

dormitory. (See dwelling.)

dwelling.

—**one-family dwelling.** A building containing one dwelling unit with not more than five (5) lodgers or boarders.

—**two-family dwelling.** A building containing two (2) dwelling units with not more than five (5) lodgers or boarders per family but not more than twenty (20) individuals.

—**multi-family—apartment house.** A building containing more than two (2) dwelling units.

—**boarding house, lodging house, tourist house.** A building arranged or used for lodging, with or without meals, for compensation, more than five (5) and not more than twenty (20) individuals.

—**dormitory.** A building arranged or used for lodging six (6) but not more than twenty (20) individuals and having common toilet and bathroom facilities.

- hotel.** A building arranged or used for sheltering, sleeping, or feeding, for compensation, of more than twenty (20) individuals.
- dwelling unit.** One or more rooms arranged for the use of one (1) or more individuals living together as a single housekeeping unit, with cooking, living, sanitary and sleeping facilities.
- draft regulator.** A device which functions to maintain a desired draft in the appliance by automatically reducing the draft to the desired value.
- exitway.** The exit doorway or doorways, or such doorways together, with connecting hallways or stairways, either interior or exterior, or fire escapes, designed to provide means by which individuals may proceed safely from a room or space to a street or to an open space which provides safe access to a street.
- fire division.** The interior means of separation of one part of a floor area from another apart together with fire-resistive floor construction to form a complete fire barrier between adjoining superimposed floor areas in the same building or structure.
- fireresistance.** That property of materials or their assemblies which prevents or retards the passage of excessive heat, hot gasses, or flames under conditions of use.
- fireresistance rating.** The time in hours or fractions thereof that materials or their assemblies will resist fire exposure as determined by fire tests conducted in compliance with recognized standards.
- fire separation.** Exterior fire exposure; the distance in feet measured from any other building on the site, or from an interior lot line, or from the opposite side of a street or other public space to the building.
- fire wall.** (See wall.)
- garage.**
 - private.** A garage for four (4) or less passenger motor vehicles with no provision for repairing or servicing such vehicles for profit.
 - public.** A building or structure for the storage, care or repair of motor vehicles not included in the term "private garage."
- grade.** (1) For buildings adjoining one street only, the elevation of the established curb at the center of the wall adjoining the street. (2) For buildings adjoining more than one street, the average of the elevations of the established curbs at the center of all walls adjoining streets. (3) For buildings having no wall adjoining the street, the average level of the ground adjacent to the exterior walls of the building. All walls approximately parallel to and not more than fifteen (15) feet from a street line are to be considered as adjoining the street.
- grade hallway, grade lobby, grade passageway.** An enclosed hallway, exitway, or corridor connecting a required exit to a street or to an open space or court communicating with a street.
- gas vent.** An enclosed passageway used for the removal of the products of combustion. (See section 113.2)
- habitable attic.** (See attic, habitable.)
- habitable room.** A room or enclosed floor space arranged for living, eating, and sleeping purposes (not including bathrooms, water closet compartments, laundries, pantries, foyers, hallways and other accessory floor spaces).
- hallways, grade.** (See grade hallway.)
- hallway, public.** (See public hallway.)

height of building. The vertical distance from the grade to the top of the highest roof beams of a flat roof, or to the mean level of the highest gable or slope of a hip roof. When a building faces on more than one street, the height shall be measured from the average of the grades at the center of each street front.

hotel. (See dwelling.)

interior lot line. Any lot line other than one adjoining a street or public space.

listed. Refers to appliances and accessories which are shown in a list published by an approved nationally recognized testing agency such as the American Gas Association, Inc., Laboratories, and Underwriters' Laboratories, Inc., qualified and equipped for experimental testing, and maintaining and adequate periodic inspection of current production of listed models and whose listing states either that the appliance or accessory complies with nationally recognized safety requirements or as been tested and found safe for use in a specified manner. Compliance may be determined by the presence on the appliance or accessory of a label of such a nationally recognized testing agency.

In cases where no applicable standard has been developed for a given class of appliance or accessory, approval of the authority having jurisdiction should be obtained before the appliance or accessory is installed.

lodging house. (See boarding house.)

lot line. A line dividing one lot from another, or from a street or public space.

minimum habitable room height. A clear height from finished floor to finished ceiling of not less than seven and one-half ($7\frac{1}{2}$) feet, except that in attics and top half-stories the height shall be not less than seven and one-third ($7\frac{1}{3}$) feet over not less than one-third ($\frac{1}{3}$) the floor area when used for sleeping, study or similar activity.

minimum habitable room size. A room with a minimum dimension of seven (7) feet and a minimum area of seventy (70) square feet between enclosing walls or partitions, exclusive of closet and storage spaces.

motor fuel service station. A structure, building, or premise or any portion thereof where a flammable fluid is stored, housed, or sold for supply to motor vehicles.

motor vehicle repair shop. A building, structure or enclosure in which the general business of repairing motor vehicles is conducted including a public garage.

multi-family dwelling. Apartment house. (See dwelling.)

noncombustible. Incombustible; a general relative term; its precise meaning is defined in the Basic Building Code for specific applications.

occupancy load. The number of individuals normally occupying the building or part thereof, or for which the exit facilities have been designed.

occupiable room. A room or enclosed space designed for human occupancy in which large numbers of persons congregate for amusement, educational or similar purposes, or in which persons are engaged at labor, and which is provided with exits, light and ventilation meeting the requirements of the Basic Building Code and the Abridged Building Code.

parking structure. (See public parking structure.)

party wall. (See wall.)

- penthouse.** An enclosed structure above the roof of a building, other than a roof structure, extending not more than twelve (12) feet above the roof, and occupying not more than thirty-three and one-third ($33\frac{1}{3}$) per cent of the roof area.
- petroleum bulk storage.** A building or structure for the storage of lubricating oils with a flash point of three hundred (300) degrees F. or higher and storage space for not more than one motor vehicle.
- place of assembly.** A room or space accommodating one hundred (100) or more individuals for religious, recreational, educational, political, social and amusement purposes or for the consumption of food and drink, including all connected rooms or space with a common means of entrance and exit.
- place of outdoor assembly.** Premises used or intended to be used for public gatherings of two hundred (200) or more individuals in other than buildings.
- public corridor.** An enclosed public passageway with access to and from individual apartments, offices or rooms leading to a public hallway or to the exitways.
- public hallway.** A public corridor or space separately enclosed or providing common access to all the exitways of a building in any story.
- parking structure.** An unenclosed or partially enclosed structure for the parking of motor vehicles, with no provision for the repairing or servicing of such vehicles.
- public space.** A plot or area of land outside of the building dedicated or devoted to public use by legal mapping or any other lawful procedure.
- repair.** The replacement of existing work with equivalent materials for the purpose of its maintenance, but not including additional work that would affect safety, or affect required exit facilities, or a vital element of an elevator, plumbing, gas piping, wiring, ventilating or heating installation, or any work that would be in violation of a provision of this code or any other law governing building construction.
- roof covering.** The covering applied to the roof for weather resistance, fire resistance or appearance.
- roof structure.** A structure above the roof of any part of a building enclosing a stairway, tank, elevator machinery or ventilating apparatus, or such part of a shaft as extends above the roof.
- slow burning.** This is a general relative term. Its precise meaning is defined in this code for specific applications.
- standard fire test.** The standard controlled furnace test formulated under the procedure of the American Society for Testing Materials and designated ASTM E119 as listed in appendix B.
- story.** That part of a building comprised between a floor and the floor or roof next above. (See also mezzanine.)
- street.** A primary thoroughfare or highway of thirty (30) feet or more in width as dedicated or devoted to public use by legal mapping, use or other lawful means.
- street lot line.** The lot line dividing a lot from a street or other public space.
- structure.** An assembly of materials forming a construction for occupancy or use including among others, buildings, stadiums, gospel and circus tents, reviewing stands, platforms, stagings, observation towers, radio towers, water tanks, trestles, piers, wharves, open sheds, coal bins, shelters, fences and display signs.

tourist home. (See boarding house.)

use group. The classification of a building or structure based on the purpose for which the building or structure is designed or used.

vent system. The gas vent or chimney and vent connector, if used, assembled to form a continuous open passageway from the gas appliance to the outside atmosphere for the purpose of removing vent gases.

wall.

fire wall. A wall having adequate fireresistance and structural stability under fire conditions to accomplish the purpose of completely subdividing a building or of completely separating adjoining buildings to resist the spread of fire.

—party wall. A wall on an interior lot line used or adapted for joint service between two buildings.

writing. The term shall be construed to include handwriting, typewriting, printing, photo-offset or any other form of reproduction in legible symbols or characters.

written notice. A notification in writing delivered in person to the individual or to the parties intended or delivered at or sent by registered mail to the last business address known to the party giving the notice.

yard. An unoccupied space on the same lot with a building extending along the entire length of a street, or rear, or interior lot line.

zoning. The reservation of certain specified areas within a community or city for buildings and structures, or use of land, for certain purposes with other limitations such as height, lot coverage and other stipulated requirements.

SECTION 102.0. CLASSIFICATION BY USE GROUPS

For the purpose of this code, all buildings and structures shall be classified in one of the use groups herein defined; high hazard, business, assembly, institutional, and residential use groups. (See article 2 and table 6, Basic Building Code.)

102.1. High Hazard Use Group.—All buildings and structures or parts thereof shall be classified in the high hazard use group which are used for the storage, manufacture or processing of highly combustible or explosive products or materials which are likely to burn with extreme rapidity or which may produce poisonous fumes or explosions; for storage or manufacturing which involves highly corrosive, toxic or noxious alkalies, acids or other liquids or chemicals involving flame, fume, poisonous, irritant or explosive gases; and for the storage or processing of any materials involving explosive mixtures of dust or which result in the division of matter into fine particles subject to spontaneous ignition.

102.2. Business Use Group.—All buildings and structures or parts thereof that are designed or used for the transaction of business, or for the manufacture, fabrication, assembling, processing or storage, or for the sale of goods, wares, and merchandise, not including those that involve highly combustible, flammable or explosive products or materials of the high hazard use group shall be classified in the business use group, including motor vehicle service stations and similar establishments.

102.3. Assembly Use Group.—All buildings and structures or parts thereof which are designed or which are primarily used for public assembly

for the purpose of amusement, entertainment, recreation, education or religion shall be classified in the assembly use group.

102.4. Institutional Use Group.—All buildings and structures or parts thereof which are used for harboring people for penal, correctional, medical or other care or treatment shall be classified in the institutional use group.

102.5. Residential Use Group.—All buildings and structures or parts thereof which are designed for, or in which families or households live, or in which sleeping accommodations are provided with or without dining facilities, excluding those that are defined as institutional buildings, shall be classified in the residential use group.

SECTION 103.0. CLASSIFICATION BY CONSTRUCTION TYPES

For the purpose of this code, all buildings and structures erected or to be erected, altered or extended in height or area shall be classified with respect to construction as one of the following construction types: fireproof, noncombustible, exterior masonry wall, and frame type. (See article 2 and table 5, Basic Building Code.) It shall be unlawful to post, use, designate or advertise a building as of a specified type of construction unless it complies with all the minimum requirements of this code for that type.

103.1. Fireproof Construction Type.—All fireproof (types 1-A and 1-B) buildings shall be constructed with enclosure walls of masonry, reinforced concrete or other approved noncombustible materials with a fire-resistance rating as required in table 5 of the Basic Building Code; and with interior walls, floors, roofs, permanent partitions, exitways and structural elements designed and protected with noncombustible materials to afford the specified fire-resistance ratings of table 5 of the BBC; except that the fire-resistance rating may be waived where unprotected steel is permitted under the provisions of section 103.6.

103.2. Noncombustible Construction Type.—All noncombustible buildings (types 2-A, 2-B and 2-C) shall be constructed entirely of steel, concrete or other approved noncombustible materials with the minimum fire-resistance ratings of the enclosure walls specified in table 2, section 107.4 of this code when erected within the fire limits; and exitways shall be constructed with a fire-resistance rating of not less than three-quarter ($\frac{3}{4}$) hour in other than one- and two-family dwellings. Noncombustible type construction may be protected with noncombustible materials to afford fire-resistance ratings of three-quarter ($\frac{3}{4}$) and one and one-half ($1\frac{1}{2}$) hours as regulated by table 5, Basic Building Code.

103.3. Exterior Masonry Wall Construction Type.—All masonry wall type buildings shall be constructed with exterior, fire and party walls of masonry or other approved noncombustible materials with fire resistance ratings as required in table 5 in appendix E-1, with roofs, floors and interior framing wholly or partly of wood or other approved materials, or of heavy timber mill-type construction and exitways constructed and enclosed as required in section 108; except that girders and their supports carrying walls of masonry shall be protected to afford the required fire-resistance rating of the walls supported thereon. The interior framing of exterior masonry wall buildings may be of heavy timber construction or of wood members of smaller sizes with or without fireresistance rating as provided in table 5 in appendix E-1.

103.4. Frame Construction Type.—All frame type buildings shall be constructed with walls, partitions, floors and roofs wholly or partly of wood stud and joist assemblies complying with section 111, or of other approved materials of similar combustible characteristics; and with approved fire-stopping at all vertical and horizontal draft openings as specified in section 119.9. The enclosure walls, interior framing and partitions may be protected to furnish one-half ($\frac{1}{2}$) hour fire resistance.

103.5. Height and Area Limitations.—Except as herein specifically provided, all buildings shall be constructed and protected to develop the fire-resistance ratings specified in table 5 of the Basic Building Code (see appendix E); and the areas and heights of all buildings and structures between exterior walls or between exterior walls and fire walls shall not exceed the limitations fixed in table 6 of the Basic Building Code for one-story buildings (see appendix E), subject to the fire limit restrictions provided in section 107.2.

103.51. Multi-Story Buildings.—Buildings two (2) stories in height may be built to the same area limits provided in table 6 for one-story buildings. In buildings over two (2) stories in height, the area limits of table 6 for one-story buildings shall be reduced for each story of height over two (2) stories in all use groups as herein specified:

1½-hour protected noncombustible construction (Type 2-A).....	1/20
All other types of construction (Types 2-B, 2-C, 3-A, 3-B, 3-C, 4-A and 4-B)	
3-story	1/5
Over 3-story	1/10

103.6. Exceptions to Fire-Resistive Requirements.—In fire-resistive construction, the fire-protective covering may be omitted from roof trusses, girders, beams and purlins when every part of the structural framework is twenty (20) feet or more above the floor immediately below; and the roof slabs or other construction between purlins shall be entirely of noncombustible materials of the required strength or of mill-type construction; or may be constructed of approved roof deck materials which are equal in strength and fire resistance to mill-type construction.

SECTION 104.0. ADMINISTRATION AND ENFORCEMENT

The building official is invested with the authority and responsibility to enforce all laws controlling safe building construction. In the smaller community, this duty is frequently delegated to a committee of the town council or selectmen which should consist of not less than three members who should appoint a qualified building official to carry out the details of inspection and enforcement of regulations and orders.

If compliance with the building official's orders does not ensue, the customary procedure is to report the facts to the municipal law officer to take the appropriate legal action. If work is being done, or existing conditions are such as to constitute danger to the occupants or the public, the building official must have the authority to take immediate steps for removal of the unsafe conditions without court action.

While the building department acts in the interest of the entire community to insure structural, fire and health safety, it serves also in an

advisory capacity and renders special services to the man who builds. With the usual small municipal budgets, it is often impossible to operate without fees for permits, inspections and other services rendered.

Exacting fees for inspections and imposing penalties for violations will create a fund that might well be utilized to finance the operations of the building department. Where the local laws do not require all money receipts to be placed in general municipal funds, a building code fund might be established to be used exclusively under the direction of the local council or the committee of selectmen for the administration of the building code. The building inspection departments of many municipalities are now operated on a self-sustaining basis.

In progressive communities, it is also recommended that a planning board of qualified civic-minded citizens be formed to act in an advisory capacity. The planning board can render valuable services in consultation with the municipal authorities in directing the growth of the community and recommending solutions of unusual problems involved in building construction.

104.1. Administrative Authority.

104.11. Building Official.—When not otherwise provided for by the municipal charter, the governing body of the municipality shall appoint a building official to whom shall be delegated the duty to administer the building laws. The building official shall be authorized and directed to enforce all the provisions of this code, and shall have the authority to enter any building or premises within the municipality for the purpose of inspection or for the prevention of violations of the provisions of this code. The building official shall be generally informed on good engineering practice in respect to the design and construction of buildings, the basic principles of fire prevention, requirements for means of egress and the installation of plumbing and other service equipment necessary for the health, safety and general welfare of the public. He shall make all inspections within twenty-four (24) hours after call or other notice from the owner or his representative or within such reasonable time as the circumstances permit.

104.12. Relief from Personal Responsibility.—The building official, officer or employee charged with the enforcement of this code shall not be personally liable while acting for the municipality, and he is hereby relieved from all personal liability for any damage that may accrue to persons or property as a result of any act required or permitted in the discharge of his official duties.

104.13. Rule Making Authority.—The building official shall have power as may be necessary in the interest of public safety, health and general welfare, to adopt and promulgate rules and regulations to interpret and implement the provisions of the Abridged Code to secure the intent thereof and to designate requirements applicable because of local climatic or other conditions; but no such rules shall have the effect of waiving working stresses or fire-resistive requirements specifically provided in the Abridged Code or of violating accepted engineering practice involving public safety.

104.14. Accepted Engineering Practice.—In the absence of approved rules, the regulations, specifications and standards listed in appendix A—Accredited Authoritative Agencies, appendix B—Accepted Engineering Practice, and appendix C—Accredited Material Standards, shall be deemed

to represent accepted engineering practice in respect to the material, equipment, system or method of construction therein specified.

104.15. Promulgation of Rules.—No rule or regulation shall become effective until four weeks after the intention to adopt such rules shall have been published in accordance with local statutes in an official paper or public newspaper with general circulation in the municipality, and only after a public hearing shall have been held on the rule.

104.16. Amendment of Rules.—All rules adopted by the procedure herein established shall have the same effect as provisions of the Abridged Code; but such rules may be amended or repealed at any time by the same procedure herein prescribed for their adoption.

104.2. Application for Permit.—No building or structure or part thereof shall hereafter be erected, converted, repaired, altered or enlarged until a building permit has been obtained by the owner or his agent. The application for a permit shall be made in writing on approved forms; and shall be accompanied by two (2) complete sets of dimensioned plans showing all habitable floors, basement, cellar, foundations and sections, and by specifications describing the kind, size, quality and grade of all construction materials and service equipment. The building official may waive the requirement for filing plans when the work involved is of a minor nature and the building operation is adequately described in the application. All plans submitted for filing shall be prepared and signed as required by the statutes of the State of (name of state). Where compliance with state statutes governing building construction is required, the application shall be accompanied by a set of the plans approved by the designated authority.

104.21. Service Connections.—Before a building can be demolished or removed, the owner or agent shall notify all utilities having service connections within the building, such as water, electric, gas, sewer and other connections. A permit to demolish or to remove a building shall not be issued until a release is obtained from the utilities, stating that their respective service connections and appurtenant equipment, such as meters and regulators, have been removed or sealed and plugged in a safe manner.

104.22. Plot Diagram.—There shall also be filed with each application a description of the premises and a dimensioned plot diagram showing to scale the size and location of all new construction and all existing structures on the site, distances from lot lines, established street grades and existing sewers, gas, water and other public utilities in the street. In the case of demolition, the plot diagram shall show all construction to be demolished and all construction that is to remain on the site.

104.3. Approved Plans.—One copy of the approved plans and specifications together with a signed permit shall be kept at the site of the operation during all times that work is in progress and until the completion of the building. After issuance of a building permit, the approved plans and specifications shall not be altered unless any proposed change is first approved by the building official as conforming to the provisions of this code. A building permit shall become void unless operations are commenced within six (6) months from date of approval, unless such time is extended by the building official. One set of the approved plans of every building or structure other than temporary structures shall be kept on file in the office of the building official as a permanent official record.

104.31. Fees.—Before receiving a building permit, the owner or his agent shall pay the fees specified in table 1. In applying the provisions of this code in respect to new work, existing buildings, alterations and repairs, the physical value of the work shall be determined by the building official on the basis of current costs and as provided in section 106.5, or as otherwise provided in the local ordinances.

TABLE 1.—SCHEDULE OF PERMIT FEES

Valuation of work	Fee	Suggested fee
Under \$50	—	\$2
\$50 to \$500	—	\$3
\$501 to \$1000	—	\$4
\$1001 to \$10,000	—	\$4 plus \$2 for each additional thousand or part thereof
\$10,001 and over	—	\$22 plus \$1 for each additional thousand or part thereof

104.4. Stop-Work Order.—Whenever the provisions of this code or of the plans and specifications approved thereunder are not complied with, a stop-work order shall be served on the owner or his representative and a copy thereof may be posted at the site of the construction. Such stop-work order shall not be removed except by written notice of the building official after satisfactory evidence has been supplied that the violation has been corrected.

104.5. Violations.—It shall be unlawful for any person to erect, use, occupy or maintain any building or structure in violation of any provision of this code or to cause, permit or suffer any such violation to be committed. Any such person shall be deemed guilty of a misdemeanor and upon conviction shall be punished by a fine of ——— dollars or by imprisonment for not more than ——— days, or by both such fine and imprisonment for each provision of law thus violated. It shall be the responsibility of the offender to abate the violation as expeditiously as possible, and each day that such violation is permitted to continue shall constitute a separate offense.

104.6. Board of Appeals.

104.61. Application for Appeals.—The owner of a building or structure or any other person may appeal from a decision of the building official refusing to grant a modification of the provisions of the Abridged Building Code covering the manner of construction or materials to be used in the erection, alteration or repair of a building or structure to the board of appeals. Application for appeal may be made when it is claimed that: the true intent of the Code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of the Abridged Building Code do not fully apply, or an equally good or better form of construction can be used.

104.62. Constitution of the Board of Appeals.—Membership of Board—The board of appeals shall consist of five (5) members appointed by the chief appointing authority of the municipality, one (1) member to be appointed for five (5) years, one (1) for four (4) years, one (1) for three (3) years, and should be one (1) for two (2) years, and one (1) to serve one (1) year; and thereafter each new member to serve for five (5) years or until a successor has been appointed.

Qualifications of Board Members.—Each member shall be a licensed professional engineer or architect, or a builder or superintendent of building construction; each of at least ten (10) years experience, for five (5) years of which he shall have been in responsible charge of work; and at no time shall there be more than two (2) members of the board selected from the same profession or business; and at least one (1) of the professional engineers shall be a licensed structural or civil engineer of architectural engineering experience.

Absence of Members.—During absence of a member by reason of disability or disqualification, the appointing officer shall designate a qualified substitute.

104.63. Rules of the Board.—The board shall select one (1) of its members to serve as chairman, and the building official shall designate a clerk from the department to serve as secretary to the board, who shall keep a detailed record of all proceedings on file in the department of building inspections.

Exemption of Members.—No member of the board shall pass on any question in which he is engaged as a contractor or material dealer, or in the preparation of plans or specifications, or in which he has any personal interest.

104.64. Compensation of Board of Appeals.—Compensation of appointed members of the board shall be determined by the proper authority of the municipality.

104.65. Appeals Procedure.

Notice of Meeting.—The board shall meet upon notice of the chairman within ten (10) days of the filing of an appeal or at stated periodic meetings if warranted by the volume of work.

Public Hearing.—All hearings shall be public, and the appellant, his representative, the official of the municipality and any other person whose interests may be affected by the matter on appeal, shall be given an opportunity to be heard.

Adjourned Meetings.—When five (5) qualified members are not present to consider a specific appeal, either the appellant, the building official or their representative may request a postponement of the hearing.

104.66. Decisions of Board of Appeals.

Action of Board.—The board shall affirm, modify or reverse the decision of the building official by a concurring vote of three (3) members;

Resolution of Board.—Every action of the board shall be by resolution and certified copies shall be furnished to the appellant and to the building official.

Determining Vote.—Failure to secure three (3) concurring votes shall be deemed a confirmation of the decision of the building official, except that the appellant shall be entitled to further hearing before a full board if there were not five (5) qualified members present when the vote was taken.

104.67. Enforcement of Decision.—The building official shall take immediate action in accordance with the decision of the board.

104.68. Court Review.—Any person aggrieved by a decision of the board of appeals, whether or not a previous party to the decision, or any municipal

officer or official board of the municipality, may apply to the appropriate court for a writ of certiorari to correct errors of law in such decisions. Application for review shall be made to the proper court of jurisdiction within fifteen (15) days after filing of the board's decision in the office of the building official.

104.7. Controlled Materials Procedure and Approval.—When plans for the erection or alteration of a building are prepared by a professional engineer or registered architect, licensed under the laws of the State of [name of state], and such plans and specifications are accompanied by an affidavit of the applicant that he has supervised the preparation of all the design plans and that he will supervise or check all working drawings and shop details for the construction; and that the structure will be built under his field supervision and in accordance with the approved plans, and that such plans conform to all the provisions of this code and the Basic Building Code, and that all the materials used in the construction will be selected or identified as to stress grade and quality in accordance with the controlled materials procedure, the building official may issue a permit for the erection of the building. The building official shall make such inspections during the progress of the work and shall issue such orders as he may deem essential to secure compliance with the building code.

Before such building or structure is permitted to be used or occupied, the licensed professional engineer or registered architect who prepared and filed the original plans and who supervised the erection of the building shall file an affidavit stating under oath that the provisions of this code have been fully complied with and that the building meets all the requirements of law for the proposed use and occupancy. (See sections 129 and 722 of the Basic Building Code.)

104.8. Special Technical Services.—When applications for unusual technical design or magnitude of construction are filed, the building official may refer such plans and specifications to the Structural Bureau of the Building Officials Conference for analysis and recommendation as to safety of design and compliance with this code; or the building official may retain a properly qualified licensed engineer or registered architect to examine the application for a specific building operation with respect to safety and compliance with this code and all other statutory requirements.

104.9. Coordinated Inspection.—All provisions of the laws and regulations of the State [name of state], and of legally adopted rules of local fire, health and labor officials in respect to the operation, equipment, house-keeping, fire protection, handling and storage of flammable materials, liquids and gases and the maintenance of safe and sanitary conditions of use and occupancy in all buildings shall be strictly enforced by the administrative officials to whom such authority is delegated. Whenever inspection by any authorized enforcement officer discloses any violation of the provisions of this code or of any other rules, regulations or laws, he shall immediately notify the administrative officer having jurisdiction of the violation. (See sections 104 and 404 of the Basic Building Code.)

104.91. Inspections required by the Building Official.—Inspections shall be made after proper notification by the building permit holder. The usual required inspections other than those required for service equipment are

as follows:

- Form inspection prior to placing foundation.
- Foundation wall inspection prior to backfilling.
- Rough framing inspection prior to insulation or interior covering.
- Sewer inspection.
- Rough plumbing inspection.
- Rough electrical inspection.
- Final inspections.

SECTION 105.0. ALTERNATE CONSTRUCTIONS

105.1. New Materials and Methods.—All new materials, methods of construction, devices and equipment shall be approved by the building official for use in buildings by the procedure herein provided when they are proved to be the equal of those specifically required by this code; or he may adopt the recommendations and approvals of the Building Officials Conference of America in respect thereto, subject to local climatic or other conditions.

105.2. Tests.—Unless based on accepted engineering design, all new building materials, appliances, equipment, systems or methods of construction not provided for in this code shall be subjected to tests that simulate the actual conditions which occur in normal use. Such tests shall be made at the expense of the applicant at an accredited laboratory and copies of the test results shall be kept on file in the office of the building official. (See sections 109, 803, 804 and 805 of the Basic Building Code.)

The building official shall accept duly authenticated reports from recognized authoritative sources in respect to the use of any new materials, methods or systems of construction complying with the applicable specifications and standards of accepted engineering practice as listed in appendixes A and B insofar as they conform to the requirements of this code, subject to local climatic or other conditions.

105.3. Approvals.—Whenever any material, appliance or method of construction shall have been approved for use under this code, a record of such approval and the conditions and limitations of its approval shall be kept on file in the office of the building official and shall be open to public inspection during business hours.

105.4. Prefabrication.—Prefabricated assemblies not capable of design by accepted engineering analysis shall be subjected to the same tests required for at-site construction. When prefabricated assemblies are not readily accessible for inspection at the site, the licensed engineer or architect or other authorized and approved representative of the manufacturer shall furnish a verified report of inspection. All tests and inspection records shall be accessible to the building official at all times during fabrication and erection of the building or assembly unit, or such records as he may designate shall be filed with him. (See article 19, Basic Building Code.)

105.5. Identification of Product.—All new materials and prefabricated assemblies approved for use under this code shall be identified by the approved label, the grade mark, the trademark or by other approved manufacturer's identification. A drawing of the official identification mark shall be kept on file in the office of the building official.

SECTION 106.0. EXISTING BUILDINGS

106.1. Existing Use Unchanged.—The legal use and occupancy of any building or structure existing on [*date of adoption of this code*], or for which it had been heretofore approved, may be continued without change when such use is not detrimental to the general safety and welfare of the public, provided the building is not enlarged in height or area and the exit facilities are adequate for a new building of the same use and occupancy load. (See sections 106, 306, 406, 506, 606, 706, 1006, 1106, 1206, 1306, 1406, 1506, 1606, 1706, 1806, and 1906 of the Basic Building Code.)

106.2. Change in Use.—If the use or occupancy of an existing building is changed to a use or occupancy which would be prohibited in a new building hereafter erected of similar construction and size, the entire building shall be made to conform to the requirements of this code for such new building; except that if the use or occupancy of only a portion or portions of an existing building is changed and such portion or portions are segregated by fire divisions as provided in section 119.2, then only such portions shall be made to comply with all the requirements of this code; or the building official may accept substitute solutions which insure an equal degree of safety.

106.3. Alterations and Repairs.—When an existing building is damaged by fire or other cause or if alterations and repairs are made to an extent of fifty (50) per cent or more of the physical value of the building before such damage or alteration, the entire building or structure shall be made to comply with the requirements of this code for new buildings. If the cost of such alterations or repairs is less than fifty (50) per cent of the physical value of the building, the building official shall determine to what degree the portions so altered or repaired shall be made to conform to the requirements of this code except as provided for roofing in section 106.4.

106.4. Roofing Repairs.—The replacement of more than twenty-five (25) per cent of the roof covering of an existing building or structure in any one period of twelve (12) months with the same materials of which it is constructed shall be prohibited unless the entire roofing is made to comply with the requirements of section 119 for new roofing.

106.5. Determination of Physical Value.—In applying the provisions of section 106, the physical value of the building shall be based on the estimated current replacement cost of the complete structure.

106.6. Nuisance Abatement Order.—Whenever an existing building is damaged to an extent of fifty (50) per cent or more of the replacement value, and the damage is not repaired or the nuisance is not abated, the building official shall serve a written order on the owner to abate the nuisance or demolish the building within thirty (30) days of the receipt of such notice. Each day that the damaged structure shall be permitted to stand after the expiration of the thirty (30) day period shall constitute a separate violation of this code subject to the penalties provided in section 104. If the owner fails to abate or remove the nuisance within sixty (60) days after service of the notice, the municipality shall employ the necessary labor and materials to perform emergency repairs or to demolish the damaged building or structure as may be deemed necessary for the general public health and safety; and the legal authority of the municipality shall institute the appropriate action against the owner of the premises for

recovery of the costs; and such costs shall become a lien against the premises until the claim is satisfied. (See sections 123, 124, 125 and 126 of the Basic Building Code.)

106.7. Unsafe Buildings.—The building official shall condemn all unsafe buildings and shall order such buildings to be taken down, removed, or made safe and secure as he may deem necessary or as provided in this code. All buildings that are or hereafter shall become unsafe structurally, unsanitary, or deficient in exit facilities, or which constitute a fire hazard, or which are otherwise dangerous to human life or the public welfare by reason of illegal or improper use, occupancy or maintenance shall be deemed unsafe buildings or structures. A vacant building with unguarded opening shall be deemed to constitute a fire hazard and to be unsafe within the provisions of this code.

106.8. Notice of Unsafe Buildings.—When an unsafe condition is found in a building or structure, the building official shall serve a written notice on the owner or his agent specifying the repairs or improvements required to render the building or structure safe and secure, or to demolish the structure or part thereof within a stipulated time.

106.9. Emergency Safeguards.—When there is actual and immediate danger of failure or collapse, or when any structure or part thereof has fallen and life is endangered by the occupation of the building, the building official shall be empowered to order and require that such building or structure be vacated forthwith. He shall cause the necessary work to be done as expeditiously as possible to render such building or structure or part thereof temporarily safe; and when necessary for the public safety, he may temporarily close sidewalks, streets and adjacent buildings. All costs of emergency work shall be paid out of the municipal treasury and the legal authority shall institute the necessary court action for the recovery of the costs involved in such work from the owner of the premises as provided in section 106.6.

SECTION 107.0. FIRE DISTRICTS

107.1. Fire District Subdivision.—To control types of construction based on the inherent fire hazard of use groups of buildings, the municipal authority shall establish fire district limits to include all areas in which congested business, commercial and public assembly uses are housed. Such areas shall be designated as "within the fire limits" and shall be bounded and described as beginning at ——— to the point or place of beginning. (See section 301, Basic Building Code.)

107.2. Construction Within the Fire Limits.—All other areas not included "within the fire limits" shall be designated as "outside the fire limits". No building of frame construction shall be erected within or moved from outside to within the fire limits except as provided in this section, and no building of otherwise lawful construction shall be extended in height or area by frame construction within the fire limits, except that one- or two-family dwellings may be extended by not more than three hundred (300) square feet in area and to a height of not more than two and one-half (2½) stories nor more than thirty-five (35) feet. Roof coverings shall comply with section 119.5.

107.21. Temporary Structures.—Reviewing stands, construction sheds, shanties, canopies and similar temporary structures may be erected of frame construction for a limited period of time as approved by the building official.

107.22. Fences.—Of frame construction may be erected to a height of not more than six (6) feet.

107.23. Appurtenant Structures.—Verandas, balconies and entrance porticoes and similar appurtenant structures of frame construction may be erected on dwellings, when not more than ten (10) feet in width and projecting not more than two (2) feet above the second-story floor beams, provided they do not extend nearer than five (5) feet to the lot line.

107.24. Storm Enclosures.—May be erected of frame construction not more than ten (10) feet in height and not more than three (3) feet wider than the entrance doors which they serve; provided they do not project more than six (6) feet beyond the building line.

107.25. Accessory Buildings.—Outbuildings and parking lot offices not more than ten (10) feet in height and one hundred (100) square feet in area, and greenhouses, may be erected of frame construction when accessory to a dwelling on the same lot or accessory to a lot approved for motor vehicle parking and located not less than six (6) feet from the lot line or from any other building.

Private garages not more than one (1) story or fifteen (15) feet in height when accessory to and located on a lot with a dwelling may be erected of protected frame (type 4-A) construction not more than seven hundred and fifty (750) square feet in area or of frame (type 4-B) construction not more than five hundred (500) square feet in area, when located not less than six (6) feet from interior lot lines or any building.

Boathouses not over two (2) stories or thirty (30) feet in height, nor more than one thousand (1000) square feet in area may be erected of frame construction.

Sheds open on the long side not over fifteen (15) feet in height nor more than five hundred (500) square feet in area may be erected of frame construction when located not less than six (6) feet from the lot line.

107.26. Exterior Trim.—Wood cornices and half-timbering may be erected on dwellings and business buildings; and existing openings in exterior walls of masonry enclosed buildings which are not required for ventilation or access purposes may be filled in with wood studs, metal lath and stucco or other approved construction of equal fire resistance.

107.27. Roof Structures.—Aerial supports, clothes dryers and similar structures less than twelve (12) feet in height, water tanks and flag poles may be erected of wood or other approved materials; cooling towers erected on roofs of buildings within fire districts shall be constructed of noncombustible materials, except that drip bars may be of wood.

107.28. Motor Fuel Service Stations.—Gasoline service stations and structures less than twelve (12) feet in height, water tanks and flag poles be erected of unprotected noncombustible construction within the height and area limits of use group E of table 6, Basic Building Code (see appen-

dix E), provided they are located more than eleven (11) feet from the lot line, or the exterior walls are protected against exterior fire exposure as required in table 2, section 107.4.

107.29. High Hazard Uses.—All buildings and structures of high hazard uses shall be prohibited within the fire limits; except that dry-cleaning plants and buildings of similar use groups in which less than three (3) gallons of flammable liquids with a flash point under eighty (80) degrees F., are stored in approved containers, or less than sixty (60) gallons of flammable liquids with a flash point between eighty (80) and one hundred and forty (140) degrees F., or using other than volatile flammable solvents in cleaning and dyeing operations, may be erected within the fire limits not more than one (1) story in height of protected exterior masonry construction (type 3-B) or better; but no such use shall be located in a basement of any building or in any part of a public assembly building. Paint spray, drying rooms and rooms for similar incidental uses not exceeding one thousand (1000) square feet in area shall be permitted in industrial buildings when enclosed in not less than two (2) hour fire-resistive construction. All buildings of high hazard uses when permitted within the fire limits shall be enclosed with walls of not less than two (2) hour fire-resistance rating when located within eleven (11) feet of interior lot lines or any building on the same lot.

107.3. Construction Outside the Fire Limits.—Outside the fire limits, all types of construction shall be permitted except as herein specifically prohibited or for which special approval and permit are required in connection with high hazard uses and occupancies. (See article 4, Basic Building Code.) In frame construction an exterior wall erected less than six (6) feet from its adjacent lot line shall be of three-quarter ($\frac{3}{4}$) hour fire-resistive construction including opening protectives except for store fronts and window and door openings in one- and two-family dwellings, but in no case shall such wall be located less than three (3) feet from interior lot lines. Roof coverings shall comply with section 119.6.

107.4. Lot Line Separations and Fire Exposure.—Within the fire limits, the distance between exterior walls and the nearest lot line other than street lot lines, as herein defined, or from any other building, shall conform to the requirements of table 5 of the Basic Building Code but in no case less than prescribed in table 2; except that two-hour enclosures shall be required for high hazard uses as provided in section 107.29 and as otherwise provided for special uses and occupancies. (See article 4, Basic Building Code.)

TABLE 2.—LOT LINE SEPARATIONS WITHIN FIRE LIMITS

Distance from lot line	Fire resistance of exterior walls to outside exposure*
Under 11 feet with $\frac{3}{4}$ -hour opening protectives where permitted.....	$\frac{3}{4}$ hour
11 feet and over with unprotected openings.....	Noncombustible

*See appendix C for fire-resistance ratings of the common materials of construction.

107.5. Unlimited Areas.—Outside the fire limits, the areas of buildings of other than frame construction designed for business uses not including high hazard uses, not more than one (1) story nor more than eighty-five

(85) feet in height, shall not be limited by the provisions of table 6, in appendix E-2, under the following conditions; exitways complying with section 108 of this code are provided to accommodate the entire occupancy load on each front of the building; the building is equipped with an approved one source sprinkler system, except that a sprinkler system shall not be required for buildings of noncombustible construction used exclusively for storage of noncombustible material not packed or crated in combustible material or as exempt by section 206.2 of the Basic Code for special industrial uses; and the structure is isolated on all sides by streets or other open spaces with the following minimum fire separations:

Buildings of fireproof construction.....	30 feet
Buildings of protected noncombustible construction (1½ hours).....	30 feet
Buildings of protected noncombustible construction (¾ hour).....	40 feet
Buildings of exterior masonry (heavy timber and protected ordinary) ..	40 feet
Buildings of exterior masonry (ordinary).....	50 feet
Buildings of noncombustible construction (unprotected exterior).....	50 feet

107.6. Garages and Service Stations.

107.61. Public Garages.—All buildings, structures and enclosures designed or used as public garages as defined in this code shall be limited to two (2) stories in height when of unprotected noncombustible (type 2-C) construction or ordinary (type 3-C) construction; except that such buildings when used solely for the parking or storage of passenger vehicles that will accommodate not more than nine (9) persons, may be three (3) stories in height. Such heights may be increased by one (1) additional story when the building is equipped with an approved sprinkler system. The first floor construction of public garages with basements shall be constructed waterproof and vaporproof to provide not less than two (2) hours' fire resistance. No pits shall be installed in floors below the first or grade floor; and pits in the first and upper stories, basement and cellar garages shall be equipped with mechanical or natural ventilation adequate to prevent the accumulation of carbon monoxide or exhaust fumes in excess of one (1) part in ten-thousand (10,000) (.01 percent or the concentration of gasoline vapors in excess of twenty (20) percent of the lower explosive limit. The building official may require test by a qualified testing laboratory to determine the adequacy. The cost of test shall be borne by the owner. The ventilation system shall be operated at all times the basement areas are occupied by human beings.

107.62. Motor Fuel Service Stations.—All buildings designed or used as motor vehicle or gasoline service stations shall be subject to the height and area limitations of table 6 of the Basic Building Code for business buildings (use group E). All permissible openings with a fire exposure of less than twenty (20) feet shall be provided with approved fire windows or fire doors complying with section 119.

107.63. Motor Vehicle Repair Shops.—All buildings and structures or parts thereof designed or used as motor vehicle repair shops shall be subject to the height and area limitations for moderate hazard storage buildings (use group B-1) and shall be used solely for that purpose. Exterior walls located within six (6) feet of interior lot lines or other buildings on the same lot shall be constructed without openings.

107.64. Parking Structures.—Parking structures may be erected as follows without enclosure walls except that an enclosure wall with not less than two (2) hours fire resistance, without openings therein, shall be provided when located within six (6) feet of interior lot lines. A continuous wall or protective guard rail not less than three and one-half ($3\frac{1}{2}$) feet in height of sufficient strength and design to restrain the vehicles shall be provided around the outside perimeter of the structure on each parking level and a wheel guard, not less than six (6) inches in height, shall be located so as to prevent any vehicle from striking the wall or guard rail.

If a parking structure extends below the grade that portion of the building below the ground floor shall comply with the requirements of section 107.61.

Heights and areas of parking structures shall not exceed the limits in the following table. The area of structures facing on more than one (1) street may be increased as provided in note "a" of table 6 and section 308.1 of the Basic Code.

HEIGHT AND AREA LIMITATIONS FOR PARKING STRUCTURES

Type of Construction	Height	Area in Square Feet
1-A and 1-B	Unlimited	Unlimited
2-A	7 Stories	30,000
2-B	5 Stories	30,000
2-C	3 Stories	30,000
2-C Primary frame hot-rolled structural steel	4 Stories	30,000
2-A, 2-B and 2-C	2 Stories	Unlimited

Note. The above limits of height permit parking on top level of structure.

107.65. Petroleum Bulk Storage Buildings.—Warehouses for the bulk storage of not more than fifty thousand (50,000) gallons of lubricating oils with a flash point of not less than three hundred (300) degrees F. in approved sealed containers may be erected one (1) story in height and not more than five thousand (5000) square feet in area of exterior masonry wall (type 3-C) construction outside the fire limits and of proportionate areas for higher types of construction. Not more than one motor vehicle shall be stored in such buildings unless separately enclosed with a fire division of not less than two (2) hours' fire resistance.

107.7. Private Garages.—All garages located beneath one- or two-family dwellings shall have floors, walls, partitions and ceilings separating the garage space from the dwelling constructed of not less than three-quarter ($\frac{3}{4}$) hour fire resistance, including exitway through such garages, with a three-quarter ($\frac{3}{4}$) hour fire door or a one and three-quarter ($1\frac{3}{4}$) inch solid core, flush type wood door or the approved labelled equivalent at the garage floor and a sill height of not less than four (4) inches. Garages exceeding seven hundred and fifty (750) square feet in area and attached to a one- or two-family dwelling shall be similarly protected. When such garages are separated from the dwelling spaces by an open breezeway, not less than ten (10) feet in length, the garage may be of frame construction outside the fire limits. The junction of garage wall and breezeway roof shall be firestopped to comply with section 119.9. In the case of pitched roofs, the attic space shall be cut off with a partition of not less than one-half ($\frac{1}{2}$) hour fire resistance from such breezeway. Garages not exceeding one thousand (1,000) square feet in area located

beneath multi-family dwellings or motels and in which no gasoline or oil is stored or handled shall be of not less than one and one-half (1½) hour protected construction; all other garages located under a building shall be of not less than one and one-half (1½) hour fire protected noncombustible construction.

107.8. Special Storage Spaces.—No building or any part of the lot upon which it is located shall be used for the storage or handling of any material or product which is highly combustible, noxious or otherwise dangerous to life or health without a special permit from the building official. The permit shall specify the conditions under which such use may be conducted and maintained.

107.9. Noncombustible Construction Exemption.—In all use groups except high hazard, assembly and institutional uses, one-story buildings of noncombustible (type 2-C) construction which are not more than three thousand (3000) square feet in area shall be exempt from the requirement for fire resistance of exterior walls both within and outside the fire limits.

SECTION 108.0. EXIT REQUIREMENTS

Every building and structure and part thereof hereafter erected shall have adequate exitways providing safe and continuous means of egress to a street, or to an open space with direct access to a street as herein provided. The owner or lessee of every existing building and structure shall be responsible for the safety of all persons in or occupying such premises with respect to the maintenance and adequacy of means of egress therefrom. (See section 606, Basic Building Code.)

Note: Safe Means of Egress.—Protection of life from fire is the greatest hazard to be overcome in the design of safe buildings. In the solution of this problem, either the building must be so constructed as to provide a safe area of refuge to which the occupants can escape, or adequate exit facilities must be provided to vacate the structure in times of emergency in not more than twenty (20) minutes and preferably within five (5) to ten (10) minutes.

While it might appear that the smaller buildings covered by the provisions of the ABC would offer ready solution, it is significant to note that three-quarters of the total annual toll of human life from fire is accounted for in buildings of dwelling occupancy and largely in small homes, mainly owing to the preponderance of such structures. Basements are now becoming recreation centers involving many of the hazardous attributes common to night club activities. It was originally proposed to require special fire-resistive construction for the ceilings of play rooms below grade, or a direct secondary means of egress therefrom. This provision raised considerable opposition and was eventually waived in its application to one- and two-family dwellings.

The number and kind of required exits from a building are determined by the fire hazard inherent in the habitation use and occupancy, the fire resistance of the type of construction, the flame resistance of trim and finish materials, and the layout of the building. The provision of a safe area of refuge, and the number of required secondary means of egress,

pend also upon the physical arrangement and individual characteristics of each building.

Existing substandard buildings which are not now equipped with safe exitways and auxiliary fire-protective features are a problem of urgent importance. The full requirements applicable to buildings hereafter erected are not always practical and frequently are economically prohibitive in such existing buildings.

The specific structural items and fire-protective features that are generally practical in existing buildings include: enclosure of interior stairways and exitways; enclosure of vertical shafts independent of stairways; limitation of required travel distance through unprotected corridors to one hundred (100) feet in non-fire-resistive buildings and to one hundred and fifty (150) feet in sprinklered and fire-resistive buildings; segregation of areas of high hazard use or protection with sprinklers or other automatic means of extinguishment; provision of means for transmitting alarms to the fire-fighting forces at the inception of the fire; and watchmen's services and fire brigades or fire patrols trained in the use of emergency fire-fighting equipment, particularly where large occupancies are involved. In structures of limited height, fire escapes and other emergency devices are available that provide some degree of safety.

Structural protective elements that afford the required one-half ($\frac{1}{2}$) to three-quarter ($\frac{3}{4}$) hour fire resistance are available which do not meet the ordinarily prescribed one (1) hour fire test that has been heretofore established as the minimum standard of fire resistance. A table of such assemblies will be found in appendix C of the ABC.

It is difficult to set up general principles to take care of all contingencies. The Basic Building Code provides fundamental rules for complete coverage of the whole range of uses and occupancies of buildings and structures; for means of fire venting to minimize the spread of fire and release smoke, gases and hot air in article 5; for safe exitways in article 6; for minimum fire-resistive requirements of structural elements and fire barriers in article 9; and for stand-by manual and automatic fire extinguishing and detecting equipment in article 12. Safeguards for the installation of heating equipment in articles 9 and 10, electrical wiring in article 15 and air conditioning and cooling equipment in article 18 provide the basis for eliminating major and prolific causes of fires and fire disasters in buildings.

The flame resistant properties of materials determines their resistance to burn and spread flames accompanied by the emission of smoke and toxic gases which is a source of heavy loss of life in fires. The Basic Building Code prescribes several test procedures in section 904 to govern the use of materials for trim, finish, acoustical, insulating and decorative purposes. For a complete coverage of these provisions reference is made to the restrictions contained in sections 922, 923, 924, 925 and 926 of the Basic Building Code.

108.1. One- and Two-Family Dwellings.—In one- and two-family dwellings, the exit stairway shall be not less than three (3) feet in width with continuous walls, guards or handrails projecting not more than three and one-half ($3\frac{1}{2}$) inches into the stair width.

Every sleeping room in one- and two-family dwellings, unless it has two (2) doors providing separate ways of escape, or had a door leading directly to the outside of the building, shall have at least one (1) outside window

which can be opened from the inside without the use of tools and of such design that it may serve as an emergency exit if the normal avenues of escape are blocked. The sill of the window shall not be more than three and one-half ($3\frac{1}{2}$) feet above the floor.

108.11. Treads and Risers.—The dimensions of treads and risers shall comply with section 108.8. Winders will be permitted provided the average width of tread is not less than nine (9) inches and the minimum width is not less than four (4) inches.

108.12. Headroom.—The minimum height of doors and minimum headroom in all parts of the stairway and its enclosure shall be not less than six and two-thirds ($6\frac{2}{3}$) feet measured vertically.

108.13. Height of Rise.—No stairway shall have a height of rise of more than twelve (12) feet between landings.

108.14. Exit Doors.—All doors serving as exits shall open on a platform and the width of such doors shall be not less than two and one-half ($2\frac{1}{2}$) feet nominal width; except that interior doors which provide access to or egress from a dwelling unit that do not open directly on a stair enclosure shall not be construed as exit doors.

108.15. Retail Stores.—Subject to the restrictions of the zoning laws, the first floor of dwellings may be occupied for retail store use, provided the ceilings and enclosure walls are protected with three-quarter ($\frac{3}{4}$) hour fire-resistive construction and the exitways from the residential areas are separately enclosed.

108.2. Multi-Family Dwellings.—In multi-family dwellings, approved exitways shall be provided and located so that the maximum length of travel to an enclosed interior stairway or fire tower is not more than seventy-five (75) feet in buildings of fireproof or protected noncombustible construction and not more than fifty (50) feet in buildings of all other types of construction. The interior primary stairway shall be not less than three (3) feet wide and may be constructed of wood or similar materials of equivalent combustible characteristics enclosed as provided in sections 108.23 and 108.82. The secondary exit shall be an additional enclosed stairway, an exterior stairway or a fire escape as herein provided.

108.21. Buildings with One Stairway.—Not more than one (1) stairway shall be required in multi-family dwellings (use group L-2) designed or used for not more than six (6) dwelling units and not more than three (3) stories and attic in height provided the building is not more than three thousand (3000) square feet in area of fireproof (type 1) or protected noncombustible (type 2-A or 2-B) construction and in other types of construction not more than two thousand four hundred (2400) square feet in area. The stairway shall be not less than three (3) feet wide, of noncombustible construction throughout, including the exit corridor and hallway, enclosed in two (2) hour fire-resistive construction with three-quarter ($\frac{3}{4}$) hour self-closing fire doors or the approved equivalent at the exits thereto. The distance of travel to the exit doorway shall be not more than fifty (50) feet from any point in the habitable area.

Multi-family dwellings (use group L-2) not over two (2) stories and nonhabitable attic in height, for not more than eight (8) families, nor more than four (4) families to a floor nor more than three thousand (3000) square feet in area may be constructed with one (1) stairway. The distance

of travel to the one required exit shall not exceed fifty (50) feet and the stairway shall be enclosed with partitions of not less than one and one-half ($1\frac{1}{2}$) hour fire-resistance with three-quarter ($\frac{3}{4}$) hour fire doors complying with article 9 at the openings.

108.22. Construction Limitations.—All buildings designed for multi-family dwellings more than two and one-half ($2\frac{1}{2}$) stories in height shall be of three-quarter ($\frac{3}{4}$) hour protected frame (type 4-A) construction or better.

108.23. Secondary Exit.—Except as provided in section 108.21, a secondary exit shall be available to each dwelling unit above the first floor, consisting of an exterior stairway or a fire escape of noncombustible construction when approved by the building official, with access to the street or a second interior enclosed stairway.

108.24. Outside Fire Limits.—On residence buildings not over two (2) stories and attic in height of type 3 or type 4 construction, fire escapes may be constructed of wood members not less than two (2) inches in thickness, or other approved materials of similar combustible characteristics outside the fire limits.

108.25. Stair Enclosure.—When an approved secondary exit is provided, the partitions and ceiling enclosing the primary stairway shall be of not less than three-quarter ($\frac{3}{4}$) hour fire resistance with three-quarter ($\frac{3}{4}$) hour self-closing protectives at all openings except the main exit and entrance doorway. In multi-family dwellings not otherwise required to be of fireproof or protected noncombustible construction, the stairways and enclosure may be constructed of wood or other approved combustible materials protected as herein required and firestopped as specified in section 119.9.

108.26. Treads and Risers.—The dimensions of treads and risers shall comply with section 108.8. No winders shall be permitted.

108.27. Lighting.—Required interior stairways, exitways and passageways shall be provided with windows to the outer air having a glass area of not less than ten (10) square feet opening on a street, alley, yard or court or with a plain glass ventilating skylight with a metal screen below the glass. In other than one- and two-family dwellings such additional artificial lighting shall be installed to provide an intensity of three (3) foot candles at the floor level of stairways and hallways.

108.28. Basement Recreation Rooms.—In residence buildings, other than one- and two-family dwellings, the basements of which are used as play rooms or for other recreational purposes with an occupancy load of twelve (12) or more, such areas and the stairway shall be enclosed with partitions and ceilings of not less than one-half ($\frac{1}{2}$) hour fire-resistive construction with direct access to the main street exit. A direct secondary exit from the basement to street, yard or court leading to the street shall be accepted in lieu of the requirement for an enclosed stairway.

108.3. Business Buildings.—All business, industrial and storage buildings shall be provided with sufficient enclosed exitways so that the unobstructed travel to a street exit or to the entrance to an enclosed tunnel or other enclosed passageway leading to such exit shall not exceed one hundred (100) feet from any point in the floor area. Where the area is subdivided into rooms or compartments, the travel distance from the entrance to such

rooms or compartments shall not exceed one hundred and fifty (150) feet. When the building is equipped with an approved sprinkler system, the length of travel may be increased to one hundred and fifty (150) feet in all cases.

108.31. Number of Exitways.—The number of persons to be provided for shall be at the rate of one (1) person per unit of area as regulated in table 3. Stories above or below grade shall be served by at least one (1) interior enclosed stairway which shall be not less than three (3) feet eight (8) inches wide constructed as required in section 108.8. When only one (1) exitway is provided, the distance of travel to the exit shall not exceed seventy-five (75) feet nor shall the occupancy load be more than fifty (50). When the area exceeds four thousand (4000) square feet in buildings of fireproof (type 1) or protected noncombustible (type 2-A) construction, or more than three thousand (3000) square feet in area or more than two (2) stories in height in other types of construction, there shall be two (2) such stairways or other approved exitways. When the occupancy load in any one story is greater than three hundred (300) the exitways shall meet the requirements for assembly buildings in section 108.4.

108.32. Location of Exitways.—Whenever more than one means of exit is required from any room, space or floor, they shall be placed as remote from each other as practicable and within the allowable travel distances herein prescribed.

TABLE 3.—OCCUPANCY ALLOWANCES

Use group	Floor area in square feet per occupant
Assembly with fixed seats.....	6
Assembly without fixed seats.....	15
Business buildings	100
Court rooms	40
Dance halls, lodge rooms.....	15
Hotels, lodging-houses, multi-family dwellings..	125
Institutional buildings	150
Mercantile buildings, first floor.....	30
Mercantile buildings, basement sales floor.....	30
Mercantile buildings, other floors.....	60
Schools	40
Storage buildings	300
Bowling alleys, allow 5 persons for each alley, including 15 feet of runway, and for additional areas	10

108.33. Width of Exitways.—One twenty-two (22) inch unit of exit width shall be provided for each fifty (50) persons occupying the floor area; and direct access shall be provided thereto through continuous passageways, aisles or corridors which shall be maintained free of obstruction, and shall be conveniently accessible to all occupants. Twelve (12) inches shall be considered one-half ($\frac{1}{2}$) unit with an allowance of twenty-five (25) persons.

108.34. Grade Floor Exits.—From the first or grade floor, direct exits shall be provided to the street consisting of one (1) unit of exit width for each one hundred (100) occupants in addition to the exits from upper and lower floor exitways.

108.35. Width of Doors.—The total width of exit doors to a stairway shall be that required for the capacity of the stairs but no single exit door shall be less than two and two-thirds ($2\frac{2}{3}$) feet wide, except that single

exit doors from the first floor direct to the street may be not less than two and one-half (2½) feet wide. The maximum permissible width of exit doors shall be forty-four (44) inches. A door forty (40) inches in width shall be deemed the equivalent of two (2) full units of exit width.

108.36. Door Construction and Installation.—All required exit doors shall be approved fire doors or approved flush type solid wood doors as provided in section 119.8 with not less than three-quarter (¾) hour fire-resistance rating except for grade exit doors which shall project not more than twelve (12) inches beyond the street lot line. All exit doors shall be hung to swing in the direction of exit travel without obstructing the required width of exitway. All exit doors shall be fitted with hardware, locks and fastenings which can be readily opened from the inner side without the use of keys except as herein provided for dwellings and for assembly and institutional buildings. Draw-bolts, hooks and other similar devices shall be prohibited on all required exit doors.

108.37. Treads and Risers.—The dimensions of treads and risers shall comply with section 108.8. No winders shall be permitted except on supplementary ornamental stairways not required as a means of exit which connect not more than two (2) adjoining stories in other than industrial, assembly and institutional use groups.

108.38. Stair Construction and Enclosure.—Stair construction and enclosure shall comply with the requirements of section 108.8. Minimum headroom and maximum height of rise between platforms shall conform to the requirements for dwellings in section 108.1.

108.4. Assembly Buildings.—All assembly buildings including auditoriums without an enclosed stage and theatrical accessories, armories, bowling alleys, broadcasting studios, chapels, churches, community houses, dance halls, gymnasiums, lecture halls, museums, night clubs, rinks, roof gardens, and buildings for similar uses shall be provided with sufficient exitways so that the unobstructed travel to an approved exitway from any part of the floor area shall not exceed one hundred (100) feet in buildings of fireproof and protected noncombustible construction and seventy-five (75) feet in buildings of all other construction types.

108.41. Number of Exitways.—Every tier, floor, and story of every place of public assembly shall be provided with the number of required exitways herein specified of not less than the required width for the occupancy loads.

<i>Occupancy Load Per Floor</i>	<i>Minimum Number of Exitways</i>
Not more than 500.....	2
501 to 900	3
901 to 1800.....	4
Over 1800	5

The required exits shall be remote and independent of each other and located on opposite sides of the area served.

108.42. Width of Exitways.—The stories above or below grade shall be provided with not less than two (2) enclosed stairways of noncombustible construction meeting the fire-resistive requirements of table 5, Basic Building Code. Such stairways shall be not less than three (3) feet eight (8) inches wide, leading directly to the street or to an outside area with unobstructed egress to the street. The aggregate width of exitways and

stairways shall be divided into substantially equal units and no stairway shall be more than eight (8) feet wide.

108.43. Treads and Risers.—The dimensions of treads and risers shall comply with section 108.8. The total rise of any single run of stairways between landings and intermediate platforms shall be not more than eight (8) feet and all stairways shall have handrails on each side.

108.44. Mixed Use Groups.—When places of assembly, night clubs and rooms and spaces for similar occupancies are provided in buildings of residence or business uses, the exitways shall be adequate for the combined occupancy and the means of egress from the place of assembly shall be separated from other parts of the structure. No skating rinks shall be located below the floor nearest grade. The incidental storage and use of all flammable and volatile liquids shall comply with section 404 of the Basic Building Code including the finishing rooms of bowling alleys which shall be separately enclosed in two (2) hour fire-resistive construction with floor finish of concrete or other noncombustible, nonabsorbent material.

108.45. Construction and Location of Theaters.—No theater, including motion picture theaters, shall be located above or below the grade floor of any building. All theaters and other buildings of the assembly use group shall be regulated by the height and area limitations of table 6, Basic Building Code; and when more than two (2) stories in height shall be of not less than one and one-half (1½) hour fire-resistive construction.

All auditoriums equipped with an enclosed stage, movable scenery, scenery loft, dressing rooms and other theatrical equipment shall comply with the requirements of the Basic Building Code governing such places of public assembly. (See section 418.0, Basic Building Code.)

108.46. Aisles.—When fixed seats are provided, all rows of seats shall be individually fixed or fixed in rigid units between longitudinal aisles not less than thirty-six (36) inches wide; except that aisles with banks of seats on one side only shall be not less than thirty (30) inches wide and in churches and chapels not less than twenty-four (24) inches wide. Rows of seats shall be not less than thirty-two (32) inches back to back.

When no fixed seats are provided, the tables and chairs in all rooms and spaces for public assembly shall be arranged to permit convenient access to exit doors by unobstructed aisles which are not less than thirty-six (36) inches wide.

108.47. Number of Seats.—There shall be not more than seven (7) seats intervening between any seat and the aisle or aisles. Where continuous fixed benches are used, a minimum width of eighteen (18) inches shall be provided for each person.

108.48. Panic-Proof Hardware.—In all rooms or places of public assembly with an occupancy load of more than three hundred (300), exit doors shall be equipped with panic-proof latches or bolts which release under a pressure of fifteen (15) pounds.

108.5. Institutional Buildings.—All institutional buildings shall have not less than two (2) exitways leading directly to the street or open spaces with direct access to the street equipped with doors swinging in the direction of egress, complying with the provisions of section 108.3 and as herein specifically provided.

108.51. Exit Doors.—Exit doors from hospitals and infirmaries shall be not less than four (4) feet wide in the clear.

108.52. Aisles and Corridors.—Aisles and corridors leading to exit doors shall be not less than five (5) feet wide.

108.53. Door Hardware.—In rooms of the institutional use group occupied as places of detention, exit doors shall be equipped with approved releasing devices with remote control for emergency use.

108.54. Construction Limitations.—All buildings of the institutional use group shall be of three-quarter ($\frac{3}{4}$) hour protected frame, protected ordinary, heavy timber mill or protected noncombustible construction when two (2) stories in height, and of not less than one and one-half ($1\frac{1}{2}$) hour protected noncombustible or fireproof construction when three (3) stories in height.

108.6. Attic and Roof Access.—In buildings more than three (3) stories in height with roofs having a slope of less than twenty (20) degrees, and so constructed and arranged that the roof may be used as an area of refuge from fire, at least one (1) stairway shall extend to the roof, or access shall be provided by means of a ladder and scuttle. When the roof is used as a roof garden or for other habitable purposes sufficient stairways shall extend to it to provide the necessary exit facilities required for such use and occupancy. All other roofs, except pitched roofs with a slope of more than twenty (20) degrees and uninhabitable attic spaces without stairways, shall be provided with access scuttles and ladders. Access trap doors shall be not less than two (2) feet by three (3) feet in area, constructed of metal-covered wood or of approved noncombustible materials.

108.7. Exit Signs and Lights.—All approved means of egress in other than one- and two- and multi-family dwellings shall be indicated with approved metal signs reading "EXIT" in red letters not less than six (6) inches high on a white background, or in other approved distinguishable colors. Such signs shall be illuminated by an electric light of not less than twenty-five (25) watts, or be internally illuminated with an enclosed case of noncombustible material through ruby glass by at least two (2) lamps totaling not less than fifteen (15) watts visible from the exit approach. When necessary, such signs shall be supplemented by directional signs in the access corridors indicating the direction and way of egress.

108.8. Construction of Stairways.—Except as provided for one- and two-family and multi-family dwellings in sections 108.1 and 108.2 and as further modified in this section, stairs and landings serving as exitways shall be constructed of approved noncombustible materials without openings in the enclosure other than the necessary exit doorways and window or skylight openings for light or ventilation except for wood handrails and fire-retardant finish materials applied directly over a noncombustible base. Slow-burning trim materials may be used when applied directly to a noncombustible base. They shall be built with solid risers, treads and platforms and all finished floor surfaces of approved nonslip, noncombustible materials; and shall be designed for the live loads specified in table 4.

108.81. Combustible Stair Construction.—In buildings of exterior masonry wall and frame (type 3 or type 4) construction, with occupancy loads of not more than seventy-five (75) above nor more than forty (40) below the grade floor, in all use groups other than assembly and institutional buildings, the stairways may be constructed of wood or other ma-

terials of similar combustible characteristics; except that in no case shall combustible stairs be permitted in school buildings.

108.82. Enclosures of Combustible Stairs.—The enclosure and the underside of combustible stair construction, except in one- and two-family dwellings, shall be protected with partitions and ceilings of not less than three-quarter ($\frac{3}{4}$) hour fire resistance, firestopped as specified in section 119.9, and the space below the stairs shall be kept open or shall be solidly enclosed with three-quarter ($\frac{3}{4}$) hour fire-resistive partitions.

108.83. Treads and Risers.—The dimensions of risers and treads shall comply with the following requirements:

<i>Use Group</i>	<i>Maximum Riser</i>	<i>Minimum Tread</i>
One- and two-family dwellings (use group L-3)		
All stairs with closed risers	8 $\frac{1}{4}$ "	9" plus 1 $\frac{1}{4}$ " nosing
Basement service stairs with open risers ..	8 $\frac{3}{4}$ "	9" plus $\frac{1}{2}$ " nosing
All other residential (use groups L-1 and L-2)	8"	9" plus 1 $\frac{1}{4}$ " nosing
Assembly and institutional	7 $\frac{1}{2}$ "	9 $\frac{1}{2}$ " plus nosing
Business	7 $\frac{3}{4}$ "	9 $\frac{1}{2}$ " plus nosing

108.84. Paint Finishes.—No pyroxylin paints or similar finishes shall be applied in exitways which, as dry films, produce excessive smoke or toxic fumes when exposed to fire.

108.9. Construction of Fire Escapes.—All fire escapes shall be constructed of approved noncombustible materials for the live loads specified in table 4; except that on buildings of type 3 or type 4 construction, fire escapes which accommodate not more than twenty (20) persons may be constructed of wood members not less than two (2) inches in thickness outside the fire limits. When located on the front of a building and projecting beyond the street lot line, the lowest platform shall be not less than ten (10) nor more than fourteen (14) feet above grade, equipped with a counter-balanced stairway and a fixed ladder to the roof. In alleyways and thoroughfares less than thirty (30) feet wide, the clearance under the lowest balcony shall be not less than fourteen (14) feet. Stairs of fire escapes shall be not less than twenty-two (22) inches wide, with risers not more than and treads not less than eight (8) inches, and platforms at foot of stairs not less than forty (40) inches wide by thirty-six (36) inches long, located not more than eight (8) inches below the access window or door. In other than one- and two-family and multi-family dwellings, doors and windows below and along the fire escape shall be equipped with three-quarter ($\frac{3}{4}$) hour opening protectives or their approved labeled equivalent.

SECTION 109.0. DESIGN LIVE LOADS

109.1. Minimum Floor Loads.—The live loads to be assumed in the design of buildings and structures shall be not less than the minimum uniformly distributed superimposed unit loads prescribed in table 4 in addition to all dead loads of the structure and fixed service equipment.

TABLE 4.—MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS

Use	Pounds per square foot
Assembly, fixed seats	60
Assembly, removable or no seats	100
Class rooms	60
Class rooms, fixed seats	60
Class rooms, removable seats	100
Dwelling rooms, first floor	40
Dwelling units (Multi-family dwellings)	40
Exitways, other than 1- and 2-family dwellings	100
Garages, passenger cars	75
Garages, buses and trucks	
floor slabs	175
columns, beams and girders	120
Habitable attics and dwelling rooms other than first	30
Lofts and light manufacturing	125
Office rooms	50
Public parking decks, passenger cars only	
parts of floor accessible to wheel loads	75
parts of floor not accessible to wheel loads	50
Sidewalks, vehicular driveways and yards	250
Stables	75
Storage	
light	125
heavy	250
Stores and shops	
retail—grade floor	100
—upper floors	75
wholesale	125
Uninhabitable attics	20 a
Yards and terraces, pedestrian	100

Note a. Live load need be applied to joists or to bottom chords of trusses or trussed rafters only in those portions of attic space having a clear height of forty-two (42) inches or more between joist and rafter in conventional rafter construction; and between bottom chord and any other member in trussed or trussed rafter construction. However, joists or the bottom chords of trusses or trussed rafters shall be designed to sustain the imposed dead load or ten pounds per square foot (10 p.s.f.), whichever be greater, uniformly distributed over the entire span.

109.2 Roof Loads.—Flat and pitched roofs shall be designed for a live load of not less than twenty (20) pounds per square foot of horizontal projection. In areas subject to snow loads, the roof shall be designed for a live load of thirty (30) pounds per square foot in the absence of specific information as designated by the records of the U. S. Weather Bureau listed in Appendix B for minimum loads and section 109.22.

109.21. Curved Roofs.—When the effect of slope as determined by actual test indicates lesser snow retention value, the roof load may be decreased accordingly, but in no case shall the load be assumed less than ten (10) pounds per square foot of horizontally projected roof area. When valleys are formed by a multiple series of such roofs, special provision shall be made for the increased load at the intersections.

109.22. Incidental Assembly.—Roofs of residence buildings used for incidental promenade purposes shall be designed for a minimum live load of sixty (60) pounds per square foot. All other roofs used for roof garden or assembly purposes shall be designed for a live load of one hundred (100) pounds per square foot.

109.23. Overhanging Eaves.—In other than one- and two-family dwellings, overhanging eaves, cornices and other roof projections shall be designed for a minimum uniformly distributed live load of sixty (60) pounds per square foot.

109.3. Wind Loads.—Except in geographical localities subject to winds of hurricane intensity, wind loads may be generally neglected unless the height of the structure is greater than four (4) times the minimum width, and except further as provided in sections 109.31 and 109.32.

109.31. Anchorage.—Roof framing shall be anchored to wall framing and walls to foundations to resist wind uplift and distortion.

109.32. Uplift on Eaves.—Overhanging eaves, cornices and other roof projections shall have adequate strength and stiffness to withstand an upward wind pressure of forty (40) pounds per square foot.

109.33. Ground Signs and Towers.—The wind pressure on ground signs and towers other than radio and television towers shall be assumed at fifteen (15) pounds per square foot of net exposed area normal to the wind for structures up to fifty (50) feet in height and twenty (20) pounds per square foot for structures over fifty (50) feet in height.

109.34. Roof Structures.—The wind pressure on roof signs, tank towers, stacks, chimneys and other exposed roof structures with plane surfaces shall be assumed at thirty (30) pounds per square foot applied on the net projected area of the structure normal to the wind.

109.35. Radio and Television Towers.—Radio and television towers over twelve (12) feet in height shall be constructed of steel or other approved corrosion-resistive noncombustible materials; except that isolated radio towers may be constructed of wood when not more than one hundred (100) feet in height. The structure shall be securely braced and anchored to resist a wind load of not less than thirty (30) pounds per square foot on the net area of both sides of latticed construction plus projected area of ice-covered antennae where subject to freezing temperatures. Antennae structures for private radio or television reception not more than twelve (12) feet in height may be erected on any building without a building permit. Such structures shall in no case be erected nearer to the lot line than the total height of the structure; nor shall such structure be installed near overhead electric lines nor encroach upon any street or public space.

109.4. Earthquake Loads.—In regions or under conditions which are exempt from earthquake load requirements according to section 719.1 of the Basic Building Code, all buildings and structures erected under this code shall be exempt from such requirements. In all other instances, structures of all buildings and their foundations shall be designed and constructed to resist a horizontal force acting in any direction of not less than five (5) per cent of the dead load of the completed structure; and wall parapets and exterior ornamental projections shall be capable of resisting a lateral force of not less than one hundred (100) per cent of the dead weight of the wall or other projection.

109.5. Live Load Reduction.—In the design of columns, trusses, girders, walls, piers and foundations of buildings more than one (1) story in height, design live loads of one hundred (100) pounds per square foot or less may be reduced in all use groups other than public assembly as follows:

	<i>Storage Buildings</i>	<i>Business Buildings</i>
	<i>(Live loads 100 pounds or less)</i>	
2 floors and roof.....	5%	10%
3 floors and roof.....	10%	20%

No reduction shall be made in the specified roof live loads.

SECTION 110.0. FOOTINGS AND FOUNDATIONS

All buildings and structures shall have foundation walls, piers, piles, caissons, continuous slabs or other approved foundations which shall be designed to resist frost action or shall be founded on bed rock. All footings shall be designed to distribute the load as nearly uniformly as practicable. Where permanent frost lines occur, footings may be founded on frozen soils.

110.1. Presumptive Surface Bearing Values of Foundation Materials.—Satisfactory bearing materials for foundations and footings shall include ledge rock on its natural bed; natural deposits of coarse or medium sand, gravel or dry clay, or a combination of such materials, provided they do not overlie an appreciable amount of peat, organic silt, moist or wet clay or other objectionable materials.

Unless otherwise approved by the building official, the maximum allowable pressures under spread footings at or near the surface shall not exceed the values specified in table 7. When the safe sustaining power of the soil is in doubt, or superior bearing values than herein specified are claimed, the building official may direct borings or tests to be made and shall determine the safe value to be allowed. Field loading tests shall be made when required by the building official. (See sections 725, 726, 727, Basic Building Code.) Pile foundations shall be designed to transmit building loads to lower strata of foundation materials in accordance with the provisions of sections 737 to 748, inclusive, of the Basic Building Code.

TABLE 7.—PRESUMPTIVE SURFACE BEARING VALUES FOR SPREAD FOOTINGS

Foundation material	Tons per square foot
Hard sound rock	60
Medium hard rock	40
Soft or broken bed rock	8
Compacted gravel, and sand and gravel	6
Compacted coarse sand, and hard dry clay	4
Loose coarse sand, confined	3
Loose medium sand, confined	2
Firm or stiff clay	1½
Soft broken shale, or soft clay	1

110.2. One-Story Buildings.—Mud, organic silt or unprepared fill shall be assumed to have no bearing capacity, unless approved by test, except where deemed adequate by the building official for the support of light frame structures or buildings and where permitted under the provisions of this code.

110.3. Floating Mat.—Footings for other than small frame structures not exceeding one (1) story in height and twelve hundred and fifty (1250) square feet in area shall be located on permanently undisturbed soil; except that a continuous foundation mat of reinforced concrete or other approved construction may be used when floated directly on the ground provided with a layer of broken stone not less than six (6) inches thick, or other adequate means of subsoil drainage. When required, such mats shall be installed with a ratproof apron as specified in section 116.4. The reinforcement shall be in addition to any piping installations for radiant heat purposes and the structural slab shall be not less than four (4) inches thick of approved concrete as specified in section 112.2. The requirements governing ventilation of crawl spaces in section 115 shall not be deemed

to nullify the use of floating slab foundations provided adequate provision is made for dampproofing and waterproofing when required by soil conditions.

110.4. Timber Footings.—Wood footings shall be used only when installed entirely below the permanent water line for wood frame structures, or when treated with an approved pressure preservative process, or when installed as capping of wood piles over submerged or marsh lands.

110.5. Masonry Footings.—Masonry footings for walls, columns or piers shall consist of plain or reinforced concrete or solid unit masonry as herein provided:

110.51. Wall Footings.—Concrete footings for load bearing walls shall be of adequate dimensions to distribute the load and unless otherwise required by local conditions shall be not less than sixteen (16) inches wide and eight (8) inches thick; except that for one (1) story and basement buildings with wood frame or brick veneered walls, footings that are not more than twelve (12) inches wide may be six (6) inches thick.

110.52. Pier and Column Footings.—Concrete footings for piers and columns shall have a minimum area of three (3) square feet and a minimum thickness of twelve (12) inches.

110.53. Chimney Footings.—Isolated chimney footings shall have a minimum projection of six (6) inches beyond the chimney foundation and a minimum thickness of twelve (12) inches.

110.54. Concrete Deposition.—No concrete footings shall be poured through water unless deposited by approved means to insure minimum segregation of the mix and negligible turbulence of the water; and all footings shall be protected from freezing during deposition and for a period of not less than five (5) days thereafter.

110.55. Masonry Unit Footings.—Masonry unit footings shall be laid in cement, cement-lime or other approved masonry mortar; and the width shall be not less than eight (8) inches wider than the wall or pier supported and the depth shall be not less than two (2) times the projection beyond the wall or pier. The maximum offset of each course in brick unit footings shall be one and one-half ($1\frac{1}{2}$) inches if laid in single courses and three (3) inches if laid in double courses.

110.56. Reinforced Concrete Footings.—When reinforced concrete footings are required, the edge thickness of the footings shall be not less than five (5) inches above the reinforcement with a minimum covering under the reinforcement of three (3) inches. On pile capping, there shall be not less than twelve (12) inches of concrete above and four (4) inches below the pile cut-off.

110.6. Foundation Walls.—The thickness of foundation walls shall be not less than the thickness of the wall supported and the minimum thickness shall be limited for the various materials of construction as herein specified; except that eight (8) inch foundation walls shall be permitted under brick veneered frame and ten (10) inch cavity walls when the total height of the wall including the gable is not more than twenty (20) feet. Not more than two (2) inch corbels shall be provided to furnish bearing for the full thickness of the wall supported. The top corbel course shall be a full header course, extending not higher than the bottom of the floor joists. No individual corbel shall project more than one-third ($\frac{1}{3}$) the height of the individual unit.

110.61. Reinforced Concrete.—When reinforced concrete is required to resist all stresses, the walls shall be not less than eight (8) inches thick.

110.62. Hollow or Solid Masonry and Plain Concrete.—When not more than six (6) feet deep, masonry walls shall be not less than eight (8) inches thick; and when more than six (6) feet below grade, not less than twelve (12) inches thick. Foundation walls of approved hollow masonry units shall be provided with not less than four (4) inches of solid masonry at girder bearings or shall be strengthened with buttresses.

110.63. Rubble Stone.—Walls of rubble stone shall be not less than sixteen (16) inches thick and shall be bonded as required in section 112.36.

110.64. Bonding.—All foundation walls shall be bonded as required for superstructure walls in section 112.3.

110.7. Lateral Stability.—When required by the character of the soil or other local conditions, all foundation walls below grade and all retaining walls shall be strengthened with buttresses or additional wall thickness to resist lateral soil or hydrostatic pressure; and the foundation slabs and other footings subjected to water pressure shall be designed to resist a uniformly distributed uplift equal to the full hydrostatic pressure. In no case shall the reinforcement in reinforced concrete walls be less than specified in section 116.2.

110.8. Drainage.—When a building or structure is floated on a foundation slab located directly on soil without a cellar, the footing materials below and around the perimeter of the slab shall be constructed to afford adequate drainage in accordance with section 110.3. When a cellar is provided and the foundation walls are of inadequate strength and tightness to resist lateral water pressures, drain tile or equivalent drainage ditches shall be provided around the perimeter of the footings.

110.9. Mortar in Masonry Foundation Walls.—All masonry walls and foundations in contact with the earth shall be laid up with portland cement or approved masonry mortar complying with section 112.

SECTION 111.0. WOOD FRAME CONSTRUCTION

Exterior walls and interior partitions of wood frame structures which are constructed of either balloon, braced or platform types shall consist of sills, posts, girts and ribbon strips braced to develop the required strength and rigidity in compliance with the requirements of this section and as specified in appendix D-5, tables 12 and 13 of this code. The frame shall be braced at all angles or adequately sheathed and the floor, attic and roof framing of wood joists, beams and rafters shall be secured by nailing as specified in appendix F; or by any other approved connecting devices of equal strength.

111.1. Grades and Sizes.—All lumber and timber used in load bearing members shall be sound, free from rot and large or loose knots, and damaging diagonal or spiral grain; and shall be of the structural grade corresponding to the stresses used in the design. When the grade of lumber is not identified in accordance with the National Design Specifications for Stress-Grade Lumber, the maximum allowable working stresses for the species of lumber used shall not exceed the lowest stress values given

for that species. All lumber sizes herein specified are nominal sizes; and the American Lumber Standards for dressed sizes shall be accepted as the corresponding minimum net dimensions. Except as herein provided for composite or built-up integrated units, or when approved after test as specified in section 105, no wood floor beam, roof beam, joist, rafter or framing timber shall be less than two (2) inches in thickness.

111.2. Floor Joists and Rafters.—For residential occupancy the spans for joists and rafters shall be as provided in table 8 in appendix D-4; except that where lumber is properly identified by species and grade, the spans for joists and rafters for residential and other occupancies shall be determined in accordance with the accepted engineering practice standards listed in appendix B of this code.

111.21. Bridging.—In all floor, attic and flat roof joist framing, there shall be not less than one line of bridging for each eight (8) feet of span and the bridging shall be of not less than one by three (1 x 3) inch lumber double-nailed at each end, or of equivalent metal lateral bracing of equal rigidity secured at the intersection. A line of bridging shall also be required at supports where adequate lateral stiffness is not otherwise provided.

111.22. Cutting and Notching.—In girders, beams or joists, cuts and bore holes shall not be deeper than one-fifth ($\frac{1}{5}$) the beam or girder depth or more than two (2) inches in diameter; and shall not be located nearer to the end of the span than three (3) times the beam depth nor within the center third of the span, unless reinforced to meet stress calculations. In studs of bearing walls or partitions, notches made to receive piping or duct work, or for other fabrication purposes, shall be cut not more than one-third ($\frac{1}{3}$) the depth of the stud, or the required studs shall be doubled or otherwise reinforced.

111.23. Connections and Fastenings.—All structural members shall be connected and fastened at their junction with connectors, bolts, lag screws, spikes, nails, straps or other approved devices or by approved gluing as provided herein and in accordance with the recommended nailing schedule in appendix F.

111.24. Plates and Ribbon Boards.—Plates which are used in exterior walls to support joists or rafters shall be double, of the same width as the supporting studs and each not less than two (2) inches thick. In non-bearing partitions, at least one (1) top and bottom plate shall be provided of the same width as the studs; and the partition shall be firestopped as required in section 119.9. Ribbon boards which support floor or roof joists shall be not less than one by four (1 x 4) inches in size and shall be nailed thereto as required by the nailing schedule. Sills shall be at least the equivalent of a two by six (2 x 6) inch stud.

111.25. Roof Rafters.—Roof rafters shall be vertically supported at the ridge or shall be adequately trussed or tied together with not less than one by six (1 x 6) inch collar beams spaced not more than five (5) feet on centers, and each rafter shall be fastened to the wall plate or wall studs.

111.26. Multiple Joists and Rafters.—Floor joists under bearing partitions shall be doubled or formed of built-up sections or may be replaced by a solid section of adequate strength to support the load. Dormer windows and other openings in roofs shall be framed with double rafters and headers. Valley rafters on spans over twelve (12) feet, measured horizontally, shall be doubled.

111.27. Bearing and Anchorage on Girders.—Floor beams framing into girders shall be anchored, tied or nailed to secure continuity. The ends of all beams or joists resting on girders shall bear not less than four (4) inches or shall be supported in approved metal stirrups or on wood clips or ribbon strips not less than two by three (2 x 3) inches in size. Beams or joists framing from opposite sides shall either lap not less than six (6) inches and be securely bolted or spiked together, or when framing end to end, all joists, beams and girders shall be secured together by approved metal ties, straps or dogs.

111.28. Joints in Girders.—The joints of solid or built-up beams or girders shall be made over column or pier supports when constructed as simple spans. When constructed of multiple joists as continuous girders, the joints shall be broken in adjoining joists; and all joints shall be located between one-sixth ($1/6$) and one-quarter ($1/4$) the span length from supports and shall be securely nailed or otherwise bonded together in an approved manner.

111.29. Spacing of Beams.—Beams and joists shall be spaced not more than twenty-four (24) inches on centers for one inch floor or roof sheathing except for approved, integrated assemblies; and for heavier planking, the spacing shall be not more than thirty-two (32) times the thickness of the planking, center to center of beam supports; except that when reinforced with finish flooring, the span of sub-floor planking shall not exceed forty-eight (48) times the thickness of the planks.

Any spacing of beams and joists determined on the basis of accepted engineering analysis or tests in accordance with the provisions of the Basic Building Code shall be acceptable.

111.3. Headers and Trimmers.—All headers more than four (4) feet in length and their trimmers shall be doubled. Headers with four (4) or more tail beams or six (6) feet or more in length shall be supported on approved metal joist hangers. When nailing is permitted, the tail and header beams shall be secured in accordance with the nailing schedule in appendix F. All tail beams or joists which are twelve (12) feet or more in length shall be hung in approved joist or beam hangers. All trimmer beams shall be spiked together.

111.4. Walls, Partitions and Posts.—The load-bearing value of isolated posts or struts shall be limited by table 12 and of framed walls and partitions by table 13, appendix D-5, of this code. All wood posts used in basements or cellars shall have concrete bases which extend not less than three (3) inches above the finished floor and bear directly on the post footing. When flooring of concrete or other approved impervious materials is not provided, the concrete base shall extend not less than six (6) inches above the finished floor.

111.41. Multiple Stories.—When the frame is more than one (1) story in height and studs or posts are not continuous from sill to roof, the members shall be secured together with approved clips, splices or other connections to insure continuity and a well-integrated structure. Sheet metal clamps, ties, or clips shall be formed of galvanized steel or other corrosion-resistive materials, of not less than No. 20 U. S. gage steel for two (2) inch framing members and not less than No. 18 U. S. gage in thickness for three (3) inch members. For four (4) inch and larger members, column

splices and beam girder supports shall be affected with approved post caps of metal or reinforced concrete or with through-bolted corbel blocks or side bolsters.

111.42. Bracing.—In buildings more than one (1) story in height, corner posts shall be the equivalent of not less than three (3) pieces of two by four (2 x 4) inch studs braced by not less than one (1) piece of one by four (1 x 4) inch diagonal let into the studs; or the frame shall be sheathed with a material to afford the same rigidity or by other approved method. Diagonal bracing may be omitted when sheathing is provided in accordance with section 111.53.

111.43. Framing Over Openings.—Lintels over openings in bearing walls or partitions of one- and two-family dwellings shall consist of double joists not less than herein specified or trussed construction bearing on jack studs, or other approved construction affording adequate strength:

	<i>Supporting 1 floor or roof</i>	<i>Supporting 2 floors or roofs</i>
Spans less than four (4) feet	two 2" x 4"	two 2" x 6"
Spans four (4) feet to six (6) feet	two 2" x 6"	two 2" x 8"
Spans six (6) feet to eight (8) feet	two 2" x 8"	two 2" x 10"
Spans eight (8) feet to ten (10) feet	two 2" x 10"	two 2" x 12"

111.44. Foundation Anchorage.—When required to resist wind uplift, wall sills shall be anchored to foundation walls at corners and at intermediate intervals of not more than eight (8) feet with one-half ($\frac{1}{2}$) inch bolts embedded in the masonry foundation to a depth of not less than eight (8) inches.

111.45. Framing of Openings.—All windows and door openings shall have double studs for the full height of the opening at jambs, with double headers or trussed construction over the opening as provided in section 111.43, or by other approved methods or connection devices to support the superimposed loads.

111.5. Sheathing, Decking and Plywood Subflooring.—Exterior walls of enclosed frame buildings shall be sheathed as herein provided. Roofs of wood construction and plywood sub-floors shall conform to the requirements hereof.

111.51. Types of Sheathing.—Except when back-plastered stucco construction is used, or the stucco is furnished with a wrapping of No. 18 U. S. gage wire attached horizontally on the studs at six (6) inch intervals, the sheathing of all exterior frame walls shall consist of one of the following materials or any other approved material of equal strength and durability approved by the building official: 1 inch reinforced cement mortar; 1 inch wood sheathing; $\frac{1}{2}$ inch gypsum boards; $\frac{1}{2}$ inch fiber boards; $\frac{5}{16}$ inch plywood.

111.52. Nailing.—Wood sheathing boards shall be nailed to each stud and to the top and bottom plates and sills as provided in the nailing schedule (appendix F.).

111.53. Omission of Bracing.—The diagonal bracing specified in section 111.42 may be omitted when diagonal wood sheathing or vertically applied plywood or other approved sheathing is installed in panels not less than four (4) feet by eight (8) feet in area.

111.54. Paper-Back Lath Sheathing.—In one- and two-family dwellings and one (1) story business buildings with brick or other masonry veneers, the sheathing may consist of a layer of approved paper-backed wire fabric of not less than No. 16 U. S. gage galvanized wire with stiffening ribs not more than five (5) inches on center, to which is attached a double layer of fibrous waterproof backing. The veneer shall be laid up with a one (1) inch intermediate space which shall be mortar filled as each course of brick is applied.

111.55. Types of Roof Decking.—Roof deck sheathing shall consist of not less than one (1) inch boards or approved plywood of the thickness specified herein or other approved materials of equivalent strength and rigidity. If open-deck sheathing is used on pitched roofs, it shall consist of not less than one by four (1 x 4) inch roofers spaced not more than six (6) inches on centers.

The maximum spans of horizontal load-bearing plywood sheathing and roof decking shall be limited by the allowable stresses and deflection for the design live load, but shall have not less than the following thickness when laid parallel to the load-supporting span:

PLYWOOD ROOF SHEATHING
DOUGLAS FIR PLYWOOD
AND

GROUP II**, SHEATHING GRADE, WESTERN SOFTWOOD PLYWOOD

*Maximum Horizontal Span, Inches,
Center to Center of Supports**

<i>Thickness of Plywood</i>	<i>20-Pound Load</i>	<i>30-Pound Load</i>	<i>40-Pound Load</i>
$\frac{5}{16}$ inch rough	20(a)	20	20
$\frac{3}{8}$ inch rough	24(a)	24	24
$\frac{1}{2}$ inch rough(b)	32(a)	32	30
$\frac{5}{8}$ inch rough(b)	42(a)	42	39
$\frac{3}{4}$ inch(b)	48(a)	48	42

WESTERN SOFTWOOD PLYWOOD, GROUP II** (d)

*Maximum Horizontal Span, Inches,
Center to Center of Supports**

<i>Thickness of Plywood</i>	<i>20-Pound Load</i>	<i>30-Pound Load</i>	<i>40-Pound Load</i>
$\frac{5}{16}$ inch rough	16(a)	16	16
$\frac{3}{8}$ inch rough	20(a)	20	20
$\frac{1}{2}$ inch rough(c)	26(a)	26	26
$\frac{5}{8}$ inch rough(c)	35(a)	35	34
$\frac{3}{4}$ inch(c)	40(a)	40	37

Note a.—These spans shall not be exceeded for any load condition.

Note b.—Provide blocking or other suitable edge support when span exceeds twenty-eight (28) inches for one-half ($\frac{1}{2}$) inch; thirty-two (32) inches for five-eighths ($\frac{5}{8}$) inch; and thirty-six (36) inches for three-fourths ($\frac{3}{4}$) inch.

Note c.—Provide adequate blocking or suitable edge support when span exceeds twenty-four (24) inches for one-half ($\frac{1}{2}$) inch; twenty-eight (28) inches for five-eighths ($\frac{5}{8}$) inch; and thirty-two (32) inches for three-fourths ($\frac{3}{4}$) inch.

*For special case of two-span continuous beams spans can be increased six and one-half ($6\frac{1}{2}$) per cent except as noted under (a).

**These include Group I and Group II species from U. S. Commercial Standard CS122-56, with amendments through Nov. 1, 1959, e.g., Group I, Western larch, Western hemlock, Noble fir, Silver fir, Grand fir, California red fir, Sitka spruce, and Port Orford cedar; Group II, White fir (*Abies concolor*), Alaska cedar, and Redwood.

Note d.—This table applies also to all grades identified as Group I, excepting the Sheathing grades (C-D and C-C), which, if identified as Group I, may be used as shown in upper portion of this table for Douglas fir plywood, etc.

MINIMUM THICKNESS OF PLYWOOD SUB-FLOORS
(Plywood continuous over 2 or more spans and face grain perpendicular to supports)
DOUGLAS FIR PLYWOOD

GROUP I*, SHEATHING GRADE, WESTERN SOFTWOOD PLYWOOD

<i>Plywood Thickness(a)</i>	<i>Maximum Spacing(b) of Joists</i>		
	<i>Residential</i>		
	40 P.S.F.	50 P.S.F.	100 P.S.F.
½"	16"	16"	16"
⅝"	20"	20"	20"
¾"	24"	24"	24"

WESTERN SOFTWOOD PLYWOOD, GROUP II**

<i>Plywood Thickness(a)</i>	<i>Maximum Spacing(b) of Joists</i>		
	<i>Residential</i>		
	40 P.S.F.	50 P.S.F.	100 P.S.F.
⅝"	16"	16"	16"
¾"	24"	24"	24"

Note a.—Blocking installed at edges, unless twenty-five thirty-seconds (25/32) inch wood strip finish floor is used. If wood strips are perpendicular to supports, one-half (½) inch can be used on twenty-four (24) inch span.

Note b.—Limited by possible concentrated loading.

*These include Group I and Group II species from U. S. Commercial Standard CS122-56, with amendments through Nov. 1, 1959, e.g., Group I, Western larch, Western hemlock, Noble fir, Silver fir, Grand fir, California red fir, Sitka spruce, and Port Orford cedar; Group II, White fir (*Abies concolor*), Alaska cedar, and Redwood.

**This table applies also to all grades identified as Group I, excepting the Sheathing grades (C-D and C-C), which, if identified as Group I, may be used as shown in upper portion of this table for Douglas fir plywood, etc.

111.6. Exterior Weather Boarding and Veneers.—All exterior wall coverings shall be of approved moisture- and weather-resisting materials of sufficient stiffness and properly attached to resist rain and wind.

111.61. Types of Weather Wall Coverings.—The following materials shall be accepted as approved weather coverings of the nominal thickness specified:

Brick masonry veneers	2 inches
Stone veneers	2 inches
Clay tile veneers	¼ to 1 inch
Stucco or exterior plaster	¾ inch
Wood siding	½ inch
Precast stone facing	⅝ inch
Protected combustible siding	½ inch
Wood shingles	¾ inch
Exterior plywood	⅝ ₁₆ inch
Asbestos shingles	⅝ ₃₂ inch
Asbestos cement boards	⅝ inch
Aluminum clapboard siding	0.030 inch
Formed metal siding	28 gage

111.62. Nailing Weather Boarding, Wall and Roof Coverings.—All weather boarding and wall and roof coverings shall be securely nailed with aluminum, copper, zinc, zinc coated or other approved corrosion-resistive nails into the supporting structure in accordance with the recommended nailing schedule or the approved manufacturer's standards. Shingles and other weather coverings attached to sheathing less than one (1) inch thick, except plywood five-sixteenths (5/16) inch thick, shall be secured with approved mechanically-bonding nails or by standard

shingle nails appropriate for type of shingles in furring strips securely nailed to studs.

Wood shingles or shakes attached with approved corrosion-resistive annular grooved nails may be applied over fiberboard shingle backer or fiberboard sheathing when the installation is in accordance with the approved rules.

111.63. Exterior Stucco.—All stucco work shall be reinforced with approved metal lath or wire fabric as herein specified; except when applied directly to a masonry base, or when installed on a masonry base which is protected with bituminous surfacing. The reinforcing fabric shall be coated with zinc or other approved rust-resistive coating, or shall be manufactured from corrosion-resistive alloys.

<i>Type of Reinforcement</i>	<i>Minimum U. S. gage</i>	<i>Maximum Mesh inches</i>	<i>Minimum Weight Pounds per Square Yard</i>
Metal lath	—	—	1.8
Expanded metal	—	—	3.4
Woven wire	18	1	1.74
Woven wire	17	1½	1.41
Woven wire	16	2	1.47
Welded wire	18	4 sq. in.	0.67
Welded wire	17	4 sq. in.	0.82
Welded wire	16	4 sq. in.	1.10

When applied over approved sheathing, a covering of fourteen (14) pound waterproof felt or paper shall first be attached to the sheathing. In back-plastered stucco with the stucco extending not less than five-eighths ($\frac{5}{8}$) inch back between the studs, the waterproof paper backing may be omitted. All metal reinforcement shall be furred away from sheathing or building paper not less than one-fourth ($\frac{1}{4}$) inch with self-furring lath, metal strips or approved furring nails. When applied directly to masonry or monolithic concrete, the surfaces shall be roughened, hacked or bush-hammered to provide bond or a preparatory dash coat of portland cement grout shall be applied and kept damp for at least two (2) days after application and before applying succeeding stucco coats. At all times during application and for a period of not less than forty-eight (48) hours after application of each coat, provision shall be made to keep stucco work above fifty (50) degrees F. Stucco shall be kept a sufficient height above ground surfaces as provided in section 111.69 and all sills, coping and projecting courses shall be flashed and provided with drips to avoid water damage.

111.64. Masonry Veneers.—Veneer of unit masonry on wood framing shall be securely attached to the wood frame with corrosion-resistive anchors at vertical intervals of not more than sixteen (16) inches and horizontal intervals of not more than twenty (20) inches; except clay tile, one-quarter ($\frac{1}{4}$) to one (1) inch in thickness, when bonded to a three-quarter ($\frac{3}{4}$) inch reinforced cement mortar base as provided in section 112.27. Fourteen (14) pound waterproof felt or paper shall be attached securely to the frame back of the veneer and flashing as required in section 111.7 shall be provided where necessary to prevent moisture penetration behind the veneers. The average height of the four (4) inch brick veneer construction shall be not more

than twenty-five (25) feet above its supports on the foundation wall or on corbels of masonry or steel and two (2) inch stone veneers shall not exceed a height of eighteen (18) feet. The corbel shall project not more than two (2) inches from the face of the foundation wall as specified in section 110.6.

111.65. Metal Veneers.—Veneers of metal shall be fabricated from approved corrosion-resistive materials or shall be protected front and back with porcelain enamel or shall be enameled or otherwise treated to render the metal resistant to corrosion. Protected steel veneers shall be not less than No. 28 U. S. gage and aluminum siding not less than three hundredths (0.03) inch in thickness, mounted on wood or metal furring strips or approved sheathing on the frame construction.

111.66. Plywood Construction.—All plywood when used structurally shall meet the performance standards and all other requirements of the applicable U. S. commercial standard listed in appendix B for the type, grade, and species of plywood involved and shall be so identified by an approved agency. Working stresses shall conform to the standards of accepted engineering practice as listed in appendixes A. and B.

111.67. Integrated Assemblies.—Approved panels or other integrated assemblies fabricated of dimension lumber with wood stress-coverings glued thereto or consisting of structural units of metal-covered or molded plywood, or other approved plastics, formed and molded into prefabricated load-bearing members shall be permitted for use in floors, roofs, walls, partitions and ceilings when designed in accordance with accepted engineering practice or meeting the test requirements of section 105 of this code. All structural members shall be so connected at their junction to provide a well-integrated structure with tight weatherproof joints where exposed to the weather. The fastenings of stressed panel coverings to longitudinal or transverse structural studs or ribs shall provide rigidity equivalent to approved gluing. Nailing shall not be acceptable for this purpose. The glues shall be handled, mixed and applied in accordance with the manufacturer's specifications and the timber construction standards listed in appendix B. The glues shall be handled, mixed and applied by approved fabricators in accordance with the manufacturer's specifications. For general interior uses or for exterior use protected against the weather, group 1 glues shall be used, including among others, casein glue with mold-resistant preservative, urea-resin glue, phenol or phenol-resorcinol resin glue or their approved equivalent. For exterior use with full exposure to the weather, or for interior use when subjected to high humidity, group 2 glue shall be used, including among others, resorcinol-resin, phenol-resin or mellamine resin glues or their approved equivalent.

111.68. Spacing of Vertical Studs.—Maximum stud spacing for bearing wall and partition sheathing and for use in stress-skin panels or other prefabricated constructions shall be determined by accepted engineering analysis or by the tests prescribed for prefabricated assemblies. For average materials, the vertical loads shall not exceed the limits specified in table 13, appendix D-5. When stress-grade materials are used, the stresses and design shall conform to accepted engineering practice.

111.69. At Grade Protection.—All exterior structural and non-load bearing wood framework shall be supported on the foundation walls at heights

necessitated by the greatest average snow fall in the locality, but in no case less than eight (8) inches above the finished grade. All untreated wood sill plates shall be isolated from masonry or concrete with waterproof felt or corrosion-resistive metal, or shall be bedded in a cement mortar topping which shall be finished to provide a true and even bearing. Exposed metal siding and sheathing shall be supported on the concrete apron specified in section 116.4 or on other approved water-resistant foundation supports extending to the minimum height above grade herein specified.

111.7. Flashing.—All exterior openings shall be constructed with approved corrosion-resistive flashings at top and sides or by other approved method to be leakproof. Similar flashings shall be installed at the intersection of chimneys or other masonry construction with frame or stucco walls and as required in veneer construction in section 111.64. Such flashing shall be provided with projecting lips on both sides under stucco copings; under and at the ends of masonry, wood or metal copings and sills; at wall and roof intersections; under built-in gutters; at junction of chimneys and roofs; at wall and roof intersections; and in all roof valleys and around all roof openings.

111.8. Protection of Wearing Surfaces.

111.81. Moisture Condensation and Water Leakage.—To secure weather-tightness and moisture resistance in framed walls and other hollow unoccupied spaces, the exterior wall shall be faced with approved weather-resisting covering as specified in this code; and cellular spaces shall be ventilated, or when required by the building official, interior non-corrodible vapor-tight barriers shall be installed; or other means shall be provided to avoid water leakage and moisture condensation.

111.82. Interior Surfaces.—In all habitable spaces, interior exposed wall and partition surfaces shall be faced with materials which are capable of resisting a horizontal load of not less than five (5) pounds per square foot. Combustible materials used as finish shall not exceed the limits of combustibility prescribed by section 904.4 of the Basic Building Code.

111.9. Fire-Resistance and Clearance of Combustible Framing.—When required to meet fire-resistive performance for specific applications and uses by the provisions of this code, structural wood units and assemblies shall be protected with metal, or other component materials, or shall be treated by approved pressure processes to develop the fire-resistance ratings specified in this code, or as regulated by table 5 of the Basic Building Code.

111.91. Clearance from Chimneys.—Except as otherwise permitted, no combustible material other than finished flooring shall be placed within two (2) inches of the outer face of the chimney nor within six (6) inches of any chimney opening, and finished flooring shall have not less than one-half ($\frac{1}{2}$) inch clearance from the outer face of the chimney; except that such flooring may be in contact with unplastered chimneys for a distance of not more than three (3) inches from the corner.

111.92. Clearance from Fireplaces.—All combustible header and trimmer beams shall be placed not less than four (4) inches from the face and backs of fireplaces and the spaces shall be fire-stopped as required in section 119.9. Wood or other combustible trim shall not be installed on or about a fireplace less than six (6) inches from the fireplace opening;

and when located within the twelve (12) inch boundary of the opening, such combustible construction shall project not more than one-eighth ($\frac{1}{8}$) inch from the face of the masonry for each one (1) inch distance from the fireplace opening; and no combustible mantel shall be located less than twelve (12) inches above such opening.

SECTION 112.0. MASONRY CONSTRUCTION

112.1. Wall Thickness and Height.—In all buildings and structures not more than three (3) stories or forty (40) feet in height, covered by the provisions of this code, with a clear span between exterior walls or between walls and an interior support of not more than twenty-six (26) feet, the thickness of masonry bearing walls shall be not less than herein specified; but in no case less than one-twentieth ($\frac{1}{20}$) of the height between lateral supports. The finished thickness of interior non-bearing masonry partitions or walls shall be not less than specified in section 112.18.

112.11. Solid and Hollow Unit Masonry Construction.—For all buildings in other than the institutional and residence use groups bearing walls of brick, structural clay tile, hollow or solid concrete units, or stone ashlar, shall be not less than eight (8) inches thick in the top story, but not more than twelve (12) feet in height, and not less than twelve (12) inches thick in the lower stories.

Residence Buildings Not Exceeding Thirty-Five Feet.—The thickness of bearing and non-bearing walls in buildings of the residence and institutional use groups shall be not less than eight (8) inches, provided the total height of such eight (8) inch walls including any portion below grade is not more than thirty-five (35) feet.

Residence Buildings Exceeding Thirty-Five Feet.—In residence and institutional buildings which exceed thirty-five (35) feet in height, the thickness of walls in the second and third stories shall be not less than eight (8) inches provided the total height of eight (8) inch walls is not more than thirty (30) feet, and not less than twelve (12) inches thick in the first story.

One and One-Half Story Dwellings.—In dwellings not more than one and one-half ($1\frac{1}{2}$) stories or twenty (20) feet in height, interior masonry bearing partitions may be six (6) inches thick. The exterior masonry walls of dwellings and private garages which are not more than nine (9) feet in height to the eaves, nor more than fifteen (15) feet in height to the peak of the gable, may be six (6) inches thick.

112.12. Cavity and Hollow Wall Construction.—Both the facing and backing wythes of bearing and non-bearing walls of cavity or other hollow wall construction of solid units shall each be not less than four (4) inches thick. The wythes shall be bonded together to comply with section 112.3. The cavity shall be not less than two (2) nor more than four (4) inches wide and the total thickness of wall shall be not less than ten (10) inches in buildings which are not more than twenty-five (25) feet in height; and not less than fourteen (14) inches in buildings which are not more than forty (40) feet in height with the inner wythe not less than eight (8) inches thick.

112.13. Rubble Stone Construction.—Bearing and non-bearing walls of rubble stone shall be not less than sixteen (16) inches thick.

112.14. Plain Concrete Wall Construction.—Unreinforced mass concrete walls may be two (2) inches less in thickness than solid masonry construction; but in no case shall such walls be less than eight (8) inches thick except where six (6) inch walls are permitted in one and one-half (1½) story dwellings and private garages.

112.15. Composite Wall Construction.—Bearing and non-bearing walls constructed of a combination of hollow and solid masonry units forming a composite wall shall be not less in thickness than required for walls constructed of either of the materials forming the facing and the backing. There shall be not less than two (2) inches of solid masonry on the exterior face exposed to the weather. Such walls shall be bonded as required in Section 112.3 with headers extending not less than four (4) inches into the backing.

112.16. Veneer Masonry Construction.—The thickness of the backing in bearing and non-bearing walls of veneer masonry construction shall be of the required minimum thickness for solid or hollow unit construction specified in this section, except that brick, stone or other approved masonry facing not less than four (4) inches thick, bonded as required in section 112.3, may be included in the required thickness of the wall. No material used for veneering masonry walls shall have less than the following thickness:

Architectural terra cotta (cellular).....	3 inches
Architectural terra cotta (flat slabs).....	1¼ inches
Brick	2¾ inches
Stone (natural)	2 inches
Stone (cast, artificial)	1½ inches
Precast stone facing.....	5⁄8 inch
Clay tile (structural)	1¾ inches
Clay tile (flat slabs).....	¾ to 1 inch
Marble slabs	1 inch
Structural glass	11/32 inch
Aluminum03 inch
Metal (approved corrosion-resistive)	28 U. S. gage

Facing or veneers or masonry walls or partitions shall not be considered to have structural value unless bonded as required in section 112.35 and shall be excluded in determining required thickness of bearing walls.

112.17. Anchorage of Veneers.—Four (4) inch ashlar facing shall be bonded as required in section 112.35. Thin stone, tile and terra cotta veneers three (3) inches or less in thickness shall be frost-proof and not more than two hundred and eighty-eight (288) square inches in area when subject to frost action and when not so exposed, the tile may be increased a maximum of fifty (50) percent in area and shall be anchored with corrosion-resistive anchors as provided for unbonded ashlar. Veneers one (1) inch in thickness or less of stone, ceramic or porcelain tiles or terra cotta shall be set into waterproofed, cement-mortar float coat, mounted on a one (1) inch thick mortar base. In localities subject to freezing temperatures, the base shall be reinforced as required for exterior stucco in section 111.63 and the veneers shall be anchored to masonry backing.

112.18. Non-Bearing Partitions.—When required to develop fire-resis-

tance ratings, interior non-bearing masonry partitions of terra-cotta, gypsum or other approved noncombustible materials shall be of the minimum thicknesses specified in table C-2 of appendix C; but in no case shall the unsupported height exceed the following unless reinforced or approved after test:

<i>Solid Masonry (in Inches) Thickness Exclusive of Plaster</i>	<i>Unsupported Height Feet</i>
2	8
3	12
4	15
6	20
8	25

Solid partitions of metal lath, studs and plaster may be two (2) inches thick for heights up to twelve (12) feet and shall increase one-quarter ($\frac{1}{4}$) inch in thickness for each four (4) feet increase in height.

112.2 Mortar and Concrete Mixes.—All masonry shall be laid up in mortar with cement, lime and aggregates mixed to a workable consistency in the proportions by volume herein specified. Materials used in preparing gypsum mortar shall be measured by weight.

112.21. Cement Mortar.—Cement mortar shall be composed of one (1) part of approved portland cement and a maximum of three (3) parts of approved sand aggregates to which may be added hydrated lime or lime putty not to exceed twenty-five (25) per cent of the cement content by volume. All foundations and other masonry in contact with the ground and cavity walls shall be laid up in cement mortar or masonry mortars approved for this purpose.

112.22. Cement-Lime Mortar.—Cement-lime mortar shall be composed of one (1) part of approved portland cement to not more than one (1) part of approved lime putty or hydrated lime and a maximum of six (6) parts of approved sand aggregate, or shall be an approved masonry mortar. Such mortar may be used in all walls within the provisions of this code other than specified in section 112.21 and where gypsum mortars are permitted.

112.23. Lime Mortar.—Lime mortar shall be composed of one part of approved lime putty or hydrated lime and a maximum of three (3) parts of approved aggregate. Cement may replace equal volumes of lime in lime mortar, provided the cement gaging is uniformly distributed by approved methods of mixing. Lime mortar may be used in bearing walls not more than thirty-five (35) feet in height.

112.24. Gypsum Mortar.—Gypsum mortar shall be composed of one (1) part of unfibred calcined neat gypsum plaster and not more than three (3) parts of approved sand aggregate. Gypsum mortar shall be used in all gypsum block masonry partitions.

112.25. Mass Concrete Proportions.—Cast-in-place plain or mass concrete shall be mixed in the dry, volumetric proportions herein specified: one (1) part approved portland cement to not more than seven and one-half ($7\frac{1}{2}$) parts of approved graded aggregates with not more than eight and one-half ($8\frac{1}{2}$) gallons of water to one bag of cement.

112.26. Reinforced Concrete Proportions.—Concrete for reinforced con-

crete construction shall be mixed in the dry volumetric proportions herein specified: one (1) part of approved portland cement to not more than five and one-half ($5\frac{1}{2}$) parts of approved graded aggregates with not more than seven and one-half ($7\frac{1}{2}$) gallons of water to one bag of cement.

112.27. Mortar Base for Clay Tile Veneers.—Mortar setting beds for ceramic tile veneers on vertical surfaces shall be mixed in the dry volumetric proportions herein specified; one (1) part of approved portland cement, one-half ($\frac{1}{2}$) to one (1) part of hydrated lime and four (4) to seven (7) parts of approved sand aggregates. When dolomite limes are used, they shall be of the autoclaved type. The completed mortar bed or the tile shall be treated with a one thirty-second ($\frac{1}{32}$) inch to one-sixteenth ($\frac{1}{16}$) inch in thickness skim coat of pure portland cement paste for adhesion.

112.28. Mortars for Ceramic Wall and Floor Tile.—Mortars for installing ceramic wall and floor tile shall be of the following composition measured on a volume basis:

Walls:	Scratch coat	1 cement: $\frac{1}{2}$ hydrated lime: 4 sand
	Setting bed and leveling coat	1 cement: $\frac{1}{2}$ hydrated lime: 4 sand. In West Coast States up to 7 parts sand may be used.
Floors:	Setting bed	1 cement: 5 sand
Ceilings:	Scratch coat and setting bed	1 cement: $\frac{1}{2}$ hydrated lime: 3 sand

or other mortars of comparable adhesive strength and durability. Shear bond strength shall be at least fifty (50) pounds per square inch when four and one-quarter ($4\frac{1}{4}$) inch glazed wall tile skim coated with pure cement paste are installed on four and three-eighths ($4\frac{3}{8}$) inch by two (2) inch mortar specimens, the assembly cured and tested by a compression load of fifty (50) pounds per second in accordance with commercial standard for adhesives for installations of clay tile listed in appendix B.

112.29. Organic Adhesives.—Organic adhesives to be used in installing ceramic tile shall have a shear bond strength of not less than forty (40) pounds per square inch when applied in a one-sixteenth ($\frac{1}{16}$) inch minimum thickness layer between two four and one-quarter ($4\frac{1}{4}$) inch glazed ceramic wall tile overlapping at ends by one-half ($\frac{1}{2}$) inch and dried to constant weight at one hundred ten (110) degrees F. and tested by compression loading at a rate of one-half ($\frac{1}{2}$) inch per minute. Adhesives also shall have a shear bond strength of not less than ten (10) pounds per square inch when applied as in the preceding sentence but dried seven (7) days at seventy-three and five-tenths (73.5) degrees F. followed by an additional seven (7) days immersion in water. Test shall be made in accordance with commercial standard for adhesives for installation of clay tile listed in appendix B.

112.3 Bonding of Walls.

112.31. Solid Walls.—In solid brick masonry walls, the facing and backing shall be bonded together with not less than one (1) header course in each seven (7) courses; or with not less than one full length header in each one and one-half ($1\frac{1}{2}$) square feet of wall surface. The distance between adjacent full length headers shall in no case be more than twenty (20) inches either vertically or horizontally. Header bricks from opposite faces of the wall shall break joints at the inner ends in alternate courses in walls more than eight (8) inches thick.

112.32. Hollow Unit Walls.—In walls of hollow structural clay tile, concrete or other approved hollow masonry units, the stretcher courses shall be bonded at vertical intervals of not more than thirty-four (34) inches, either by lapping not less than three and three-quarter ($3\frac{3}{4}$) inches over the unit below, or by lapping with units of not less than fifty (50) per cent greater thickness than the units below at vertical intervals of not more than seventeen (17) inches.

112.33. Cavity and Hollow Walls.—Hollow walls of solid units shall have a masonry bond equivalent to solid walls and the facing and backing shall be bonded together with headers or equivalent masonry bonding units with not less than one (1) header unit for each three (3) square feet of wall surface. Cavity walls shall be tied together with not less than three-sixteenths ($\frac{3}{16}$) inch rounds or one-eighth ($\frac{1}{8}$) by three-quarter ($\frac{3}{4}$) inch flats of corrosion-resistive metal with not less than one (1) approved tie to each three (3) square feet of wall surface.

112.34. Composite Walls.—The facing shall be bonded to the backing with headers or stretchers not less than four (4) inches thicker than the facing to the equivalent extent of one-seventh ($\frac{1}{7}$) of the area of the wall as provided in section 112.31.

112.35. Ashlar Facing.—Facings of dressed natural or cast stone shall be bonded to the backing with at least one-seventh ($\frac{1}{7}$) of the superficial area extending not less than four (4) inches into the backing. In plain coursed ashlar, at least every fourth course shall be a bond course. Bond stones shall be uniformly distributed throughout the walls; except when alternate courses are full bond courses, every stone which is not a bond stone shall be anchored to the backing with an approved corrosion-resistive metal anchor to each three (3) square feet of superficial area or part thereof.

112.36. Rubble Stone Walls.—All stones in rubbly masonry shall be laid on their natural bed and the walls shall be bonded with at least one (1) through bond stone for each nine (9) superficial square feet of area when less than twenty-four (24) inches thick and one (1) bond stone on both sides for each six (6) square feet in area of thicker walls.

112.4. Hollow Wall Construction.

112.41. Bearing Area.—Joist, beam, girder and other concentrated loads shall be provided with a bearing of solid masonry in all hollow unit and hollow wall construction or with a bearing plate of two (2) inches of solid brick or the equivalent, and the wall shall be reinforced with four (4) inch by twelve (12) inch bonded pilasters at all main girder bearings.

112.42. Closure Blocks.—All open cells in tiles or blocks at wall ends and at wall openings shall be filled solidly with concrete or its equivalent for a length of wall of not less than twelve (12) inches or reversed closure tile shall be used.

112.43. Cavity Walls.—Approved flashing shall be provided around all openings and drainage pipes or other protection shall be provided to prevent water from accumulating in the cavity. During construction, precautions shall be taken to prevent mortar droppings from obstructing and filling the cavity. All openings in cavity wall construction shall be provided with perimeter ties as specified in section 112.33 between the two wythes at not more than three (3) feet centers on all sides.

112.44. Transition in Wall Thickness.—When walls of hollow masonry are decreased in thickness, the top course units of the lower thicker wall shall be filled solidly for not less than four (4) inch depth with concrete, or such course shall be covered with solid tile slabs not less than one (1) inch in thickness, or with brick or other approved masonry not less than two (2) inches thick.

112.5. Chases and Alcoves.

112.51. Size Limitations.—The maximum permitted depth of a chase shall be not more than one-third ($\frac{1}{3}$) the wall thickness and the maximum length of a horizontal chase or maximum horizontal projection of a diagonal chase shall not exceed four (4) feet; except that the length of the apron below window sills in all walls may equal the width of the window opening and such aprons in eight (8) inch walls may be chased not more than four (4) inches in depth when waterproofed to comply with section 116.45.

112.52. Alcoves.—Recesses for alcoves, elevators, dumbwaiters, and stairways and for similar purposes shall have not less than eight (8) inches of masonry at the back.

112.53. Lintels over Chases.—When the length of a chase in bearing walls is more than twelve (12) inches, lintels shall be provided to support the masonry above the chase. All chases shall be built to have not less than eight (8) inches of approved masonry at the jambs of openings.

112.54. Hollow Walls.—Chases and recesses in hollow walls and walls constructed of hollow blocks or tiles shall be built in with the wall; and no chases shall be cut in such walls after erection.

112.55. Cutting Fire Walls.—No masonry walls of a required fire-resistance rating, which are eight (8) inches or less in thickness shall be cut for chases or socketed for insertion of structural members subsequent to erection.

112.6. Structural Members, Buttresses and Piers.

112.61. Lintels and Arches.—All openings in masonry walls shall be spanned by plain or reinforced arches, steel lintels or other approved non-combustible supports with not less than four (4) inch bearing on the wall at each end on bearing plates of metal not less than one-half ($\frac{1}{2}$) inch thick or of natural or reinforced artificial stone not less than four (4) inches thick. Plain stone lintels shall not be used on spans greater than four (4) feet nor to support load concentrations on the wall less than two (2) feet above the top of the lintel unless supplemented by structural lintels or arches. All lintels shall be of sufficient strength to support the superimposed load with a deflection of not more than one three-hundred-and-sixtieth ($\frac{1}{360}$) of the clear span; and arches shall be designed to support the load with provision to resist the lateral thrust.

112.62. Buttresses and Piers.—All wall buttresses and piers shall be built into the wall with a masonry bond. Isolated piers shall be not less than twelve (12) inches square nor more than twelve (12) times the least dimension in height when of solid masonry construction nor more than four (4) times the least dimension when of hollow masonry unless filled solidly with approved concrete. Isolated masonry piers shall be bonded as required for solid walls of the same thickness and shall be provided with a cap stone or bearing plate of the full dimension of the pier or with other adequate means for distributing the load on the top.

112.63. Bearing and Anchorage of Structural Members.—All structural beams and girders producing concentrated loads shall have a bearing on solid masonry of not less than four (4) inch thickness and shall project not less than four (4) inches into masonry walls with adequate wall-bearing plates as provided in section 112.61. All such beams and girders shall be anchored to the masonry with standard steel anchors.

112.7. Corbeling and Projecting Masonry.

112.71. Limiting Projections.—No masonry wall less than twelve (12) inches thick shall be corbeled except to support firestopping around combustible floor framing and as provided for foundation walls in section 110.6. The support of chimneys shall conform to section 113.15. The maximum horizontal projection of corbels shall be not more than one-third ($\frac{1}{3}$) the thickness of the wall nor shall the projection of any single course of masonry exceed one-third ($\frac{1}{3}$) the height of the masonry unit.

112.72. Hollow Walls.—Corbeling of hollow masonry or masonry built of hollow units shall be supported on one full course of solid masonry not less than twelve (12) inches deep.

112.8. Cornices and Exterior Trim.

112.81. Cornice Construction.—All cornices except on buildings of frame construction outside the fire limits shall be constructed of metal covered wood or other approved noncombustible materials secured to the wall with noncombustible anchors and brackets. Terra cotta, metal and molded cornices shall be installed with a structural frame anchored and supported to resist the overturning moment due to the loads specified in section 109. When exterior cornices of wood or other combustible construction are permitted they shall be firestopped at maximum intervals of twenty (20) feet. If non-continuous, they shall be closed solidly at the ends with at least four (4) inch separation between adjoining sections; and if continuous, noncombustible firestops shall be provided at the lot lines complying with section 119.9.

112.82. Balconies and Bay Windows.—All balconies, bay and oriel windows attached to or supported by walls of other than frame construction shall be constructed of approved noncombustible materials with brackets and supports of steel, concrete or other approved noncombustible materials.

112.83. Half-Timbering.—Exterior half-timbering and other architectural decorative trim erected on the face of masonry enclosure walls may be constructed of wood and similar combustible materials on all buildings within the scope of this code when backed up solidly with noncombustible materials.

112.84. Existing Combustible Trim.—Any existing cornice or other decorative elements constructed of wood or other combustible material where prohibited by the provisions of this code may be repaired with the same material, but such repairs shall not exceed fifty (50) per cent of the area of such prohibited construction in any one year.

112.9. Lateral Bracing of Walls and Erection Precautions.—All masonry bearing walls shall be laterally supported by horizontal bracing of floor and roof framing or by vertical bracing of columns, piers, buttresses or crosswalls at the intervals herein specified. In non-bearing enclosure, partition or fire division walls, the intervals between lateral bracing may be increased fifty (50) per cent above the specified limits.

112.91. Vertical and Horizontal Intervals.—The interval between hori-

zontal or vertical bracing of masonry bearing walls shall be not more than twenty (20) times the wall thickness in walls of solid masonry; eighteen (18) times the wall thickness in hollow walls and walls of hollow units; and fourteen (14) times the wall thickness in cavity wall construction.

112.92. Maximum Unbraced Length.—In no case shall the length of bearing or non-bearing walls between columns, piers, buttresses, crosswalls or other equivalent vertical bracing be more than seventy-five (75) times the wall thickness.

112.93. Temporary Bracing.—Whenever practical, masonry enclosure walls shall be carried up together and shall be temporarily braced during erection where necessary.

112.94. Anchorage of Beams.—All wood floor beams, joists and roof rafters resting on masonry walls shall be anchored with not less than one-eighth by one by sixteen ($\frac{1}{8} \times 1 \times 16$) inch metal anchors with split and upset ends at maximum intervals of six (6) feet in one- and two-family dwellings and not more than four (4) feet on centers in all other buildings. Masonry walls parallel to beams or joists shall be provided with anchors which engage not less than three (3) beams or joists at maximum intervals of eight (8) feet in one- and two-family dwellings and not more than six (6) feet in all other buildings.

112.95. Intersecting Walls.—The intersection of two (2) walls shall be bonded by not less than fifty (50) per cent of the masonry units when the two walls are laid together; and when carried up separately, the intersection shall be toothed with eight (8) inch maximum offsets and tied together with approved spear anchors at vertical intervals of not more than four (4) feet.

112.96. Erection Precautions.—All masonry shall be protected against freezing for not less than forty-eight (48) hours after installation and shall not be constructed below twenty-eight (28) degrees F. on rising temperatures or below thirty-six (36) degrees F. on falling temperatures without temporary heated enclosures or without heating materials or other approved precautions necessary to prevent freezing. No frozen materials shall be used or shall frozen materials be built upon. Brick (clay or shale) shall be wetted when laid unless their gain in weight resulting from partial immersion flatwise in one-eighth ($\frac{1}{8}$) inch of water for one (1) minute is less than twenty-five thousandths (0.025) ounce per square inch of immersed area.

SECTION 113.0. CHIMNEYS AND GAS VENTS

All chimneys and gas vents for the removal of the products of combustion hereafter erected or altered in all buildings and structures shall comply with the provisions of this section; except that minor repairs for the purpose of maintenance and upkeep which do not increase the capacity of the heating apparatus or appliances or which do not involve structural changes in the permanent chimney or gas vents may be made without a permit.

113.1. Factory-built Chimneys.—Listed factory-built chimneys shall be installed in accordance with the terms of their listings and the manufacturer's instructions.

113.11. Masonry or Metal Chimneys.—Masonry or metal chimneys shall be built and installed in accordance with nationally recognized building codes.

113.12. Connecting a Vent Connector.—Before connecting a vent connector to a chimney, the chimney passageway shall be examined to ascertain that it is properly constructed, clean and free of obstructions or debris.

113.13. Dwellings.—In one- and two-family dwellings and multi-family dwellings, chimneys may be constructed of solid masonry or reinforced concrete not less than four (4) inches thick when the area of the flue is not more than two hundred (200) square inches and the flue is provided with a clay lining; or such chimneys in one- and two-family dwellings may be factory-built specified in section 113.2. All chimney walls that are less than eight (8) inches thick shall be lined to comply with section 113.17.

113.14. Metal Chimneys.—Exterior metal chimneys shall be not less than one-eighth ($\frac{1}{8}$) inch thick for diameters up to three (3) feet and three-sixteenths ($\frac{3}{16}$) inch thick for diameters up to four (4) feet. Interior metal chimneys shall be constructed of metal not less than No. 16 U.S. gage for areas up to one hundred and fifty-four (154) square inches, No. 14 U.S. gage for areas not more than two hundred (200) square inches, No. 12 U.S. gage for areas not more than two hundred and fifty-four (254) square inches and not less than No. 10 U.S. gage for greater areas. All metal chimneys shall be galvanized or painted with an approved paint, or shall be constructed of corrosion-resistive metals or steel alloys. All such chimneys shall be securely guyed, braced, anchored and supported.

113.15. Support of Masonry Chimneys and Metal Chimneys.—All masonry chimneys and metal chimneys shall rest on a foundation located on permanently undisturbed soil or shall be supported on fireproof construction; and no chimney shall rest on or be hung or otherwise supported from combustible floor or wall construction; except as provided in section 113.2. Chimneys may be corbeled from masonry walls other than hollow or cavity wall construction or walls built of hollow masonry units; provided such corbels do not exceed the limits specified in section 112.7. Metal chimneys erected on the exterior of a building or structure shall be supported on independent substantial masonry or reinforced concrete foundations. Interior metal chimneys may be supported on fireproof construction at intermediate floor levels. Masonry chimneys erected outside of frame dwellings shall be anchored to the stud walls at each floor level or at vertical intervals of not more than ten (10) feet.

113.16. Clearances.—Combustible construction shall be trimmed away from all flues and chimneys as specified in section 111.91. Every exterior metal chimney shall have a clearance of not less than twenty-four (24) inches from frame wall construction unless insulated with not less than two (2) hour fireresistive construction. All interior metal chimneys shall be enclosed with walls of not less than two (2) hour fireresistive construction. Where such interior chimneys pass through a combustible roof, it shall be guarded with a metal ventilating thimble extending not less than nine (9) inches above and below the roof with a clearance of not less than twelve (12) inches on all sides of the chimney, unless insulated to prevent a temperature greater than two hundred and fifty (250) degrees F. on the exterior exposed surface.

113.17. Linings.—Masonry chimneys with walls less than (8) inches thick shall be lined with approved flue linings to comply with section 113.33. Medium and high temperature chimneys and stacks as defined in article 10 of the Basic Building Code shall be lined with four and one-half ($4\frac{1}{2}$) inches of fire brick, for the entire height from a point two (2) feet below the inlet opening, or shall be of double wall construction with an intervening air space of not less than two (2) inches. All flue linings shall be supported on solid brick offset or on foundations below the bottom of the cleanout.

113.18. Cleanouts.—Cleanouts shall be of such construction that they will remain tightly closed when not in use. Tee fittings used as cleanouts or condensate drains shall have tight fitting caps to prevent entrance of air into the chimney or gas vent at that point.

113.19. Size of Gas Vent or Chimney.—The gas vent or chimney when connected to a single appliance shall not be less than the size of the draft hood outlet.

When more than one appliance is connected to a gas vent or chimney, the area shall be not less than the area of the largest vent connector plus fifty (50) percent of the area of the additional vent connectors.

In lieu of the above, the gas vent or chimney may be sized in accordance with the gas vent or chimney manufacturer's approved instructions, or the use of approved engineering methods.

Any shaped gas vent may be used provided its venting capacity is equal to the capacity of round pipe for which it is substituted and the minimum internal dimension of the gas vent is not less than two (2) inches.

113.2. Factory-built Chimneys.—Factory-built chimneys that have been tested and approved by an accredited authoritative agency shall be installed in accordance with the clearances and details of their approval and the manufacturer's instructions.

113.21. Gas Appliances Connected to Chimneys.—An automatically controlled gas appliance connected to a chimney which also serves equipment for combustion of solid or liquid fuel shall be equipped with an automatic pilot. A gas appliance vent connector and a flue connector from an appliance burning another fuel may be connected into the same chimney through separate openings, or may be connected through a single opening if joined by a suitable fitting located as close as practical to the chimney. If two (2) or more openings are provided into one chimney they should be at different levels.

113.22. Supports.—In one- and two-family dwellings which are not more than two (2) stories and attic in height, factory-built chimney construction as herein described may be supported on concrete-filled pipe columns or may be hung from attic or ceiling joist of adequate strength protected with component materials to afford a fireresistance of not less than three-quarters ($\frac{3}{4}$) hour, provided all clearances are maintained as specified in this code and vents are supported on corrosion-resistive metal brackets of not less than No. 16 U.S. gage.

113.3. Appliances Requiring Chimneys.—All heating equipment except electric and gas-fired appliances, specifically exempted by the provisions of section 113.5, shall be connected to chimneys which conform to this section.

Chimneys shall be used for venting the following type appliances:

- 1—Incinerators;
- 2—Appliances which may be converted readily to use of solid or liquid fuels;
- 3—Combination gas-oil burning appliances;
- 4—Appliances listed for use with chimney only.

113.31. Labeling of Vents.—Vents installed for use of gas appliances which are not suitable for solid or liquid fuel-fired equipment shall be plainly and permanently identified by a label reading:

"This gas vent is for appliances which burn gas only. Do not connect to incinerator or solid or liquid fuel burning appliance".

This label shall be attached to a wall or ceiling at a point near where the gas vent system enters the wall, ceiling or chimney.

113.32. Existing Chimneys.—No existing chimney which does not conform to all the requirements of this section shall be continued in use unless it does not endanger the fire safety of the building and is acceptable to the building official.

113.33. Flue Linings (Masonry Chimneys).—Flue linings for masonry chimneys shall be made of fire clay or other approved refractory materials with a shell thickness of not less than five-eighths ($\frac{5}{8}$) inch capable of resisting the action of flue gases at a temperature of not less than two thousand (2000) degrees F. without softening or cracking. The flue lining shall start not less than eight (8) inches below the inlet to the chimney or the throat of a fireplace and shall extend not less than four (4) inches above the top of the chimney; except that when no masonry division is provided between flues, the flue lining shall extend to the bottom of the cleanout.

113.34. Gas Vents Serving More Than One Appliance.—Where two (2) or more vent connectors enter a common vertical gas vent or chimney, the smaller connector should enter at the highest level consistent with available headroom or clearance to combustible material. Two (2) or more gas appliances may be vented through a common vent connector or manifold located at the highest level consistent with available headroom or clearance to combustible material.

The manifold, all junction fittings, and the common vent connector shall be of a size adequate for combined volume of vent gases. The cross-sectional area of flues shall be not less than specified in table 14.

TABLE 14.—MINIMUM SIZES OF FLUES

Type of equipment	Cross-sectional area in square inches
Small space stove or heater	27
Stove, range or room heater	35
Fireplace (not less than 1-12 fireplace opening)	57
Hot water and low pressure steam boiler	57
Bakery oven with venting capacity of a nominal 8" by 12" standard tile-lined 4" brick chimney and similar equipment	120

113.4. Height of Masonry Chimneys, Gas Vents and Metal Chimneys.

113.41. Masonry Chimneys.—Chimneys and flues shall extend not less

than three (3) feet above the adjacent roof and not less than two (2) feet above any roof ridge within a horizontal distance of ten (10) feet. They shall be capped with concrete, terra cotta tile or other approved noncombustible and weather-proof materials. If the height above the roof exceeds four (4) times the minimum dimension, the chimney shall be braced and anchored to the roof framing.

113.42. Metal Chimneys.—All metal chimneys shall extend to a height of not less than four (4) feet above any roof within a horizontal distance of twenty-five (25) feet, or any roof ridge within ten (10) feet horizontally thereof; except that metal chimneys from cupola, blast and similar industrial furnaces shall extend not less than twenty-five (25) feet above any roof within a radius of fifty (50) feet and shall be covered with a spark arrestor complying with section 113.93.

113.43. Gas Vent or Chimney Termination.—The gas vent or chimney should extend high enough above the building or other neighboring obstructions so that wind from any direction will not create a positive pressure in the vicinity of the gas vent or chimney termination. Gas vents or chimneys shall extend at least two (2) feet above the highest point where they pass through a roof of a building and at least two (2) feet higher than any portion of a building within ten (10) feet except as provided in section 113.46.

113.44. Height Above Appliance.—No gas vent or chimney shall terminate less than four (4) feet in vertical height above the highest connected appliance draft hood outlet or flue collar.

113.45. Type B-W Gas Vent.—No type B-W gas vent serving a vented recessed heater shall terminate less than twelve (12) feet in vertical height above the bottom of the heater.

113.46. Listed Gas Vent.—A listed gas vent with a listed or approved top may be terminated below the peak of a pitched roof in accordance with the terms of the listing or approval.

113.47. Gas Vents and Factory-built Chimneys.—Gas vents and factory-built chimneys shall extend above the roof surface and through the flashing and shall terminate in a top or roof assembly with a venting capacity not less than that of the vent. The top shall prevent rain and debris from entering into vents.

113.5. Vents for Gas-fired Equipment.—For the purpose of determining vent requirements gas-fired appliances shall be classified as "listed" or "unlisted". A listed appliance or accessory is one that is shown in a list published by an accredited authoritative testing agency, qualified and equipped for experimental testing of such appliances, and maintaining an adequate periodic inspection of current production of listed models and whose listing states either that the appliance or accessory complies with nationally recognized safety requirements or has been tested and found safe for use in a specific manner. Compliance may be determined by the presence on the appliance or accessory of a label of the testing agency stating that the appliance or accessory complies with nationally recognized safety requirements. An unlisted appliance or accessory is one that is not shown on such a list or does not bear such a label. In cases where no applicable standard has been developed for a given class of appliance or accessory, approval of the authority having jurisdiction should be obtained

before the appliance or accessory is installed.

113.51. Vents Required.—Appliances of the following types shall be vent connected or provided with other means for exhausting the flue gases to the outside atmosphere:

- 1—Central heating appliances, including steam and hot water boilers, warm air furnaces, floor furnaces, and vented recessed heaters;
- 2—Duct furnaces and self-contained unit heaters;
- 3—Gas-fired incinerators;
- 4—All water heaters;
- 5—Built-in domestic cooking units listed and marked as vented units;
- 6—Room heaters listed for vented use only;
- 7—Appliances equipped with gas conversion burners;
- 8—Appliances which have draft hoods supplied by the appliance manufacturer;
- 9—Unlisted appliances.

113.52. Exemption.—Connections to chimney or vent shall not be required for electric, gas and industrial appliances of such size or character that the absence of such connection does not constitute a hazard to the fire safety of the building or its occupants. The following appliances are not required to be vented:

- 1—Listed gas ranges;
- 2—Built-in domestic cooking units listed and marked as unvented units;
- 3—Listed hot plates and listed laundry stoves;
- 4—Listed domestic clothes dryers;
- 5—Listed gas refrigerators;
- 6—Counter appliances;
- 7—Room heaters listed for unvented use;
- 8—Other appliances listed for unvented use and not provided with flue collars.

When any or all of the appliances listed in items 5, 6, 7, 8 and 9 above are installed so that the aggregate input rating exceeds thirty (30) B.T.U. per hour per cubic foot of room or space in which they are installed, one or more of them shall be vent connected or provided with approved means for exhausting the vent gases to the outside atmosphere so that the aggregate input rating of the remaining unvented appliance does not exceed thirty (30) B.T.U. per hour per cubic foot of room or space in which they are installed. Where the room or space in which they are installed is directly connected to another room or space by a doorway, arch, or other opening of comparable size, which cannot be closed, the volume of such adjacent room or space may be included in the calculations.

113.53. Size of Vents.—The gas vent or chimney when connected to a single appliance shall not be less than the size of the draft hood outlet.

When more than one appliance is connected to a gas vent or chimney, the area shall be not less than the area of the largest vent connector plus fifty (50) percent of the areas of additional vent connectors.

In lieu of the above, the gas vent or chimney may be sized in accordance with the approved instructions of the manufacturer, or the use of approved engineering methods.

Any shape gas vent may be used provided its venting capacity is equal to the capacity of round pipe for which it is substituted and the minimum internal dimension of the gas vent is not less than two (2) inches.

113.54. Gas Vent Termination.—The gas vent or chimney shall extend high enough above the building or other neighboring obstruction so that wind from any direction will not create a positive pressure in the vicinity of the gas vent or chimney termination. Gas vents or chimneys shall extend at least two (2) feet above the highest point where they pass through a roof of a building and at least two (2) feet higher than any portion of a building within ten (10) feet; provided the following conditions are met:

1—No gas vent or chimney shall terminate less than four (4) feet in vertical height above the highest connected appliance draft hood outlet or flue collar;

2—No type B-W gas vent serving a vented recessed heater shall terminate less than twelve (12) feet in vertical height above the bottom of the heaters.

113.55. Exception.—A listed gas vent equipped with a listed or approved top may be terminated below the peak of a pitched roof in accordance with the terms of the listing or approval.

113.56. Top Protection.—Gas vents and factory-built chimneys shall extend above the roof surface and through the flashing and shall terminate in a top or roof assembly with a venting capacity not less than that of the vent. The top shall prevent rain and debris from entering the vent.

113.6. Vent and Duct Construction.

TABLE 15.—METAL DUCT AND VENT CONSTRUCTION, OTHER THAN DWELLINGS

Diameter, or diagonal of rectangular ducts, dimension in inches	Minimum thickness	
	Galvanized Steel U. S. gage number	Aluminum B & S gage number
Up to 12	28	26
12-20	26	24
20-30	24	22
30-48	22	20
48-60	20	18
60-90	18	16
90 and over	16	14

113.61. Gas Appliance Vents.—Vents for gas-fired appliances shall be constructed of galvanized steel, cement-asbestos, metalbestos, fire-clay or other approved corrosion-resistive, noncombustible materials for the temperatures involved with tight joints as herein provided; and shall comply with the minimum thicknesses specified for ducts and vents in tables 15 and 16; or they may be factory-built chimneys.

113.62. Ducts in One- and Two-Family Dwellings.—Warm air supply ducts in heating and air conditioning systems of one- and two-family dwellings shall be constructed of aluminum, copper, galvanized steel or other approved noncombustible materials of equal strength and durability to the material specified in table 16.

TABLE 16.—DUCTS FOR DWELLINGS

Diameter, or diagonal of rectangular ducts, dimension in inches	Minimum thickness and weight		
	Tin weight per square in pounds	Galvanized steel U. S. gage number	Aluminum B & S gage number
Up to 12	IC 107	30	26
12-18	IX 135	28	26
18 and over	IX 135	26	24

113.63. Types of Gas Vents.—Type B listed factory-made gas vents for venting listed or approved appliances equipped to burn only gas, except those specifically listed for use with chimneys only.

Type B-W listed factory-made gas vents for venting listed or approved gas-fired vented recessed heaters; and they shall be installed in accordance with this listing and manufacturer's instructions.

Type C gas vents may be used to vent listed gas appliances except as provided in section 113.3, and shall be constructed of not less than 24 U.S. gage sheet copper or No. 20 U.S. gage galvanized steel or of other approved noncombustible corrosion-resistive materials of equivalent strength and durability for use in vent pipes which pass directly through the roof or exterior wall to outer air. Such vents shall not pass through any attic or other concealed space nor through any intermediate floor construction.

113.64. Fire-clay Vents.—Fire-clay vent pipes shall have a thickness of not less than one-half ($\frac{1}{2}$) inch for an internal diameter of less than six (6) inches and three-quarter ($\frac{3}{4}$) inches for an internal diameter of six (6) or more inches. The joints shall be made tight with bell and spigot, sheet metal sleeves, or galvanized iron bands of not less than No. 26 U.S. gage, thoroughly secured and cemented in place with high temperature cement mortar.

113.65. Clearances and Protection.—No gas-appliance vent shall pass through an attic, concealed space, combustible floor or roof, wall or partition unless constructed as herein provided. Such vents shall be fitted with a ventilating collar or double thimble with the annular space filled with approved noncombustible insulating material. A clearance of not less than one (1) inch shall be maintained from all combustible construction when plastered and not less than two (2) inches when unplastered; except that a vent from a floor furnace, water heater or space heater shall have a clearance of not less than three (3) inches for a distance of not less than three (3) feet from the outlet of the draft hood. All vents shall be enclosed in one-quarter ($\frac{1}{4}$) inch asbestos or three-eighths ($\frac{3}{8}$) inch gypsum boards where they pass through habitable spaces.

A vent of not less than No. 20 B & S gage aluminum, 16-ounce sheet copper, No. 26 U.S. gage monel metal or of not less than No. 20 U.S. gage galvanized iron may be used from rooms or spaces in which a gas-fired heating appliance is located, extending directly through the roof or through the exterior wall to the outer air, provided it does not pass through an attic, concealed space, or partition.

113.66. Connections and Bracing.—All seams in vents shall be made substantially air and gas tight; and the vents shall be supported on sub-

stantial, corrosion-resistive metal brackets or hangers of not less than No. 16 U.S. gage and shall be braced at not more than five (5) foot intervals.

113.67. Duct Systems.—All ducts and duct systems required for warm air heating and air conditioning systems under the provisions of sections 114 and 118 of this code shall be constructed of similar materials approved for vents, at least equivalent in strength and durability to the minimum thickness of galvanized steel specified in tables 15 and 16. They shall comply with the requirements of section 118.9 in respect to fire doors, dampers, fresh air inlets, outlets and air filters.

113.68. Hot Air Ducts.—Hot air ducts in proximity to combustible materials shall be sufficiently insulated to prevent temperatures of more than two hundred and fifty (250) degrees F. on the exterior surface. All exterior insulation of high temperature hot air ducts which carry air at a temperature of more than two hundred (200) degrees F. shall be of non-combustible materials. All interior insulation of ducts shall be noncombustible. For a distance of six (6) feet from the furnace, the clearance of a metal duct from combustible material shall be the same as that required for the furnace clearance in section 114. Where such ducts enter walls, floors or partitions within six (6) feet, they shall be enclosed in fireresistive assemblies of not less than three-quarter ($\frac{3}{4}$) hour fireresistance rating. Banks of vertical ducts or pipes which pass through two (2) or more stories in other than one- and two-family dwellings shall be enclosed in shafts of not less than three-quarter ($\frac{3}{4}$) hour fireresistive construction. Cement asbestos ducts shall have a clearance of not less than one-eighth ($\frac{1}{8}$) inch from combustible construction. When ducts pass through walls or partitions, the required clearance shall be maintained by a metal thimble filled with approved noncombustible, insulating materials, or the opening shall be closed at both ends with metal collars, firestopped as required in section 119.9.

113.69. Cold Air Ducts.—The construction of cold air ducts shall comply with all the provisions governing warm air ducts except in respect to heat insulation and clearance from combustible construction.

113.7. Chimney Connectors.—Chimney connectors shall be constructed of galvanized iron or other approved and noncombustible, corrosion-resistive material having a melt point of two hundred (200) degrees F. No tile pipe shall be used as a chimney connector.

113.71. Chimney Connection.—In entering a passageway in a masonry or metal chimney, the chimney connector shall be installed above the extreme bottom to avoid stoppage. Means shall be employed which will prevent the chimney connector from entering so far as to restrict the space between its end and the opposite wall of the chimney. The chimney connector shall be firmly attached or inserted into a thimble or slip joint to prevent it from falling out. All connections shall fit tightly. Two or more chimney connectors may be joined to a single connection provided that the chimney connectors are on one floor level and the passageway is of sufficient size to serve all the appliances thus connected.

113.72. Thickness of Metal.—The thickness of metal chimney connectors shall be not less than specified in table 15 for duct and vent construction.

113.73. Length of Chimney Connector.—Chimney connectors shall be as

short and straight as possible consistent with use and draft conditions.

113.74. Clearances.—Unless covered on the outside with one (1) inch of asbestos insulation or other approved noncombustible materials, the following clearances shall be maintained from all combustible materials and construction:

Diameter Inches	Clearance Inches
0 - 12	12
12 - 36	20
More than 36	36

The specified clearances may be reduced one-half ($\frac{1}{2}$) when an approved metal or other noncombustible enclosing shell is installed so as to provide a continuous one (1) inch ventilating air space around the chimney connector with access openings for inspection purposes; or the exposed combustible construction shall be protected with noncombustible materials as provided in table 17.

113.75. Thimbles.—No chimney connector shall pass through a floor, roof or ceiling construction. Where such chimney connectors pass through combustible walls or partitions, they shall be protected with approved thimbles fire-stopped with noncombustible materials; or the partition shall be constructed of noncombustible materials with not less than three-quarter ($\frac{3}{4}$) hour fire-resistance for a distance corresponding to the clearances specified in section 113.74.

113.8. Fireplaces.—The backs and jambs of fireplaces shall be not less than eight (8) inches thick of solid masonry or reinforced concrete with a lining of fire brick, soapstone, cast iron, or other approved noncombustible material not less than two (2) inches thick; except that such lining may be omitted when the wall construction is not less than twelve (12) inches thick or the equivalent insulation and protection is provided integrally in the approved heating equipment or firing device. In one- and two-family dwellings, when approved steel fireplace units which are equipped with an air circulating chamber are installed integrally with the fireplace construction, the backs and jambs of the fireplace may be reduced to four (4) inches of approved masonry.

113.81. Hearth.—Every fireplace shall be constructed with a hearth of brick, stone, tile or other noncombustible material. For fireplaces with an opening of less than six (6) square feet the hearth shall extend not less than sixteen (16) inches in front and not less than eight (8) inches on each side of the fireplace opening. For fireplaces with an opening of six (6) square feet or more the hearth shall extend not less than twenty (20) inches in front and not less than twelve (12) inches on each side of the fireplace opening. Such hearths shall be supported on trimmer arches of brick, stone, tile or concrete not less than four (4) inches thick, or other equally strong and fire-resistive materials. All combustible forms or centering shall be removed after completion of the supporting construction.

113.82. Fireplace Heaters.—No heater shall be installed in a fireplace unless it is provided with a flue conforming to this code; except an electric appliance or a gas appliance exempted from vent requirements under the provisions of section 113.51.

113.83. Imitation Fireplaces.—The depth of an imitation fireplace or recess for heating equipment shall be not more than six (6) inches unless such recess meets all the requirements for fireplaces. The surface of the recess shall be of masonry or fire-resistant plaster and all combustible materials shall have the clearances specified in sections 111.9 and 119.97. No flue other than an approved gas vent shall be installed within such imitation fireplace.

113.9. Incinerators and Spark Arrestors.—All incinerators, other than portable domestic incinerator units of less than two (2) square feet grate area, and gas-fired incinerators of not more than four (4) bushel capacity, constructed as an integral part of the building structure shall comply with the requirement of this section.

113.91. Non-Fuel-Fired.—When the grate area of an incinerator is not more than nine (9) square feet, the flue shall be enclosed with not less than four (4) inches of brick or reinforced concrete masonry, lined with fire-clay flue lining. When the grate is more than nine (9) square feet in area, the flue lining shall be not less than four and one-half (4½) inches of fire brick.

113.92. Fuel-fired Incinerators.—Flues for all fuel-fired incinerators shall be constructed as required for non-fuel-fired incinerators of over nine (9) square feet grate area.

113.93. Spark Arrestors.—Non-fuel-fired incinerator chimneys and all other chimneys or flues which emit sparks, such as foundry chimneys and appliances in which sawdust, shavings or wood are burned shall be provided with a spark arrestor of approved noncombustible construction with maximum mesh openings of three-quarter (¾) inch. The total effective open area of such spark arrestor shall be not less than four (4) times the flue area.

SECTION 114.0. HEATING EQUIPMENT, MOUNTING AND INSTALLATION

The provisions of this code are limited in application to heating appliances fired with solid, liquid or gas fuels in which the products of combination will result in sustained flue gas temperatures of not more than one thousand (1000) degrees F. under normal operating conditions; or a steam boiler operated at fifty (50) pounds per square inch or less gage pressure; or a steam boiler of not over ten (10) boiler horse power, regardless of operation pressure, or any equipment otherwise classified as a medium heat appliance but not larger than one hundred (100) cubic feet in size; and to gas and fuel oil fired heating appliances. The installation of heating appliances which operate at higher temperatures and pressures and industrial and power boilers shall be governed by the Basic Building Code. No permit shall be required for the installation, alteration, extension or removal of a heating boiler or furnace in a one- or two-family dwelling nor for any heating furnace which burns less than fifteen (15) pounds of anthracite per square foot of grate surface per hour, nor for gas ranges, space heaters or similar domestic gas appliances.

Installation and operation of gas appliances conforming to the applicable requirements of the standards for installation and operation of gas piping and gas appliances listed in appendix B shall be accepted as complying with requirements of the Abridged Code.

114.1. Furnace and Boiler Foundation Mountings.—Except otherwise specifically provided for the installation of approved gas and oil-fired furnaces, stoves and ranges on combustible floors, furnaces and boilers shall be mounted on the ground or on a foundation constructed of masonry, concrete or other approved noncombustible materials with the fire-resistance herein specified, extending not less than twelve (12) inches beyond the appliance on all sides.

114.11. Approved Heating and Cooking Appliances.—Approved gas and oil-burning warm air furnaces, oil-burning floor furnaces, gas-fired unit heaters, domestic incinerators and gas and oil-burning stoves and ranges inspected and approved by the accredited testing authorities listed in appendix A and contained in the published listings of such nationally recognized testing agencies shall be accepted by the building official when installed with the reduced clearances and details of installation therein recommended, provided they meet the requirements of this code for insulation. Gas-fired and electric heating and cooking ranges and other approved domestic heating and cooking appliances mounted on legs as provided in this section, or constructed with equivalent integral protection may be erected directly on wood floors or other construction of similar combustible characteristics.

114.12. Water-Cooled Base.—A boiler which has a grate area of less than three (3) square feet with a water-cooled base in which the water jacket extends under the whole of the ash pit and fire box or under the entire fire chamber when there is no ash pit, or in which the combustion chamber is not less than twelve (12) inches above the floor may rest directly on a sheet metal base of not less than No. 14 U.S. gage steel on combustible construction without masonry insulation.

114.2. Floor Clearances.—When an air space is provided between the boiler or furnace and combustible construction, protection shall be provided as herein required:

114.21. House Heating Appliances.—When heating boilers and furnaces that are mounted on legs which provide an open ventilated space of not less than four (4) inches in height under the base, the floor shall be protected with not less than one-quarter ($\frac{1}{4}$) inch mill board covered with sheet metal of not less than No. 24 U.S. gage which shall extend not less than six (6) inches beyond the appliances and not less than eighteen (18) inches where ashes are removed.

114.22. Tile Masonry Mounting.—When heating boilers and furnaces are not mounted on legs, the floor shall be protected with four (4) inches of hollow clay or concrete tile covered with No. 24 U.S. gage sheet metal with eighteen (18) inch extension for ash removal. The tile shall be laid with ends unsealed and joints notched to provide through circulation of air.

114.23. Domestic Appliances.—When domestic heating and cooking appliances are mounted on legs which provide an open ventilated space not less than eighteen (18) inches in height under the base, or which have no burners, oven or broiler within eighteen (18) inches of the floor, no special floor protection shall be required provided there is at least one (1) metal baffle between the burners and floor.

114.24. Four-Inch Clearance.—When domestic heating and cooking appliances are mounted on legs which provide an open ventilated space not less than four (4) inches in height under the base, the floor shall be protected with sheet metal of not less than No. 24 U.S. gage or other approved noncombustible material. When solid fuel-fired, the protection shall extend not less than eighteen (18) inches on sides where ashes are removed.

114.25. Restaurant Appliances.—When floor mounted ranges, ovens and similar hotel and restaurant-type appliances are mounted on legs which provide an open ventilated space of not less than eighteen (18) inches in height under the base or which have no burners, oven or broiler within eighteen (18) inches of the floor, no special floor protection shall be required provided there is at least one (1) metal baffle between burners and floor.

114.26. Eight-Inch Clearance.—When hotel and restaurant-type appliances are mounted on legs which provide an open ventilated space of not less than eight (8) inches in height under the base, the floor shall be protected with not less than three-eighths ($\frac{3}{8}$) inch mill board covered with No. 24 U.S. gage sheet metal.

114.27. Four-Inch Clearance.—When hotel and restaurant-type appliances are mounted on legs which provide an open ventilated space of not less than four (4) inches in height under the base, the floor shall be protected with not less than a single layer of hollow clay or concrete tile covered with No. 24 U.S. gage sheet metal.

114.28. Double Tile Mounting.—When restaurant-type appliances are not mounted on legs, the floor under the appliance shall be not less than three-quarter ($\frac{3}{4}$) hour fire-resistive noncombustible construction, protected with a double-tile course covered with No. 24 U.S. gage sheet metal.

114.29. Canopy Hood.—Unless enclosed and vented in an approved manner, restaurant ranges, candy kettles, cruller, bakery and confectionery furnaces and similar appliances generating hot or noxious gases and smoke shall be installed with a ventilating hood with ducts to the outer air. The hood shall be located not more than seven (7) feet above the floor and shall completely cover the appliance served with a clearance of not less than eighteen (18) inches from any combustible material or construction. The hood and ducts shall be constructed of metal or other approved noncombustible material with tight joints and shall connect to an independent smoke flue or metal smokestack complying with section 113. Such hood and ducts shall be equipped with a grease screen or filter to prevent the accumulation of grease or other flammable material in the duct and flue to which it is connected. The grease screen shall be cleaned periodically and replaced when necessary.

114.3. Wall and Ceiling Clearances and Protection.—All solid and liquid fuel-fired heat appliances shall be installed so as to have clearances from wood or other combustible materials or construction of not less than eighteen (18) inches at the top, sides and rear, and not less than forty-eight (48) inches at the front. These clearances may be decreased when the exposed construction is protected to afford the fire resistance specified in table 17, or the equivalent protection is secured by an approved arrangement of plates and baffles; or when the appliances are insulated on the exterior with approved masonry, or are jacketed with an intervening air

space, or by special approval after test of a particular type of construction or equipment.

TABLE 17.—REDUCED WALL AND CEILING CLEARANCES

Fire resistance of protected construction	Fraction of specified clearances	
	Top	Sides and rear
$\frac{1}{3}$ -hour	seven-eighths	five-eighths
$\frac{1}{2}$ -hour	three-quarters	one-half
$\frac{3}{4}$ -hour	five-eighths	three-eighths
1-hour	one-half	one-quarter

114.31. Clearance Variations.—House heating appliances, domestic-type ranges and space heaters may be installed with modified clearances as herein specified from combustible materials:

	Clearance in Inches			
	Top	Side and Rear	Front	Smoke-pipe
Heating boilers and furnaces when water or masonry jacketed..	6	6	48	18
When jacketed with $1\frac{1}{2}$ " asbestos cement.....	9	6	48	18
Mechanical warm air with 250° F. temperature limit control....	6	6	48	18
Domestic ranges and stoves.....	36	18	36	18
Ranges and stove with fire clay lining.....	24	18	24	18
Space heaters	36	18	36	18
Water heaters	12	12	12	18

Labeled heating appliances which are approved for installation with lesser requirements than herein provided may be installed in accordance with the conditions of such approval.

114.32. Deleted.—No requirements.

114.33. Solid and Liquid Fuel-Fired Equipment.—In other than one- and two-family dwellings, all steam boilers, heating furnaces and water heating apparatus using any fuel other than gas shall be enclosed in walls and ceiling of not less than two (2) hour fire-resistive construction with a three-quarter ($\frac{3}{4}$) hour fire door. The floors shall be constructed of concrete or other fire-resistive assemblies of not less than two (2) hour fire-resistance rating. Where required under the provisions of the Basic Building Code in public garages, high hazard and other special uses, such boiler rooms shall be completely enclosed in not less than two (2) hour fire-resistive construction with openings to the outside only.

114.34. Gas-Fired Appliances.—Except when the equipment is insulated by the manufacturer to prevent the transmission of temperatures in excess of two hundred and fifty (250) degrees F., gas ranges or gas water heaters shall not be placed nearer than twelve (12) inches to unprotected wood or other combustible material or nearer than six (6) inches if protected with No. 20 U.S. gage metal with an intervening one (1) inch air space, or protected with not less than one (1) inch of clay tile or three-quarter ($\frac{3}{4}$) inch of plaster on metal lath. Gas grates and gas logs when not installed in a fireplace or recess complying with section 113.8 shall have a clearance of not less than ten (10) inches to unprotected wood or other

combustible materials unless insulated as required for gas ranges. Gas water heaters placed in a recess shall have not less than six (6) inch clearances on all sides of the heater; and the recess shall be completely lined with not less than three-quarter ($\frac{3}{4}$) hour fire-resistive construction.

114.35. Gas Vent Connectors.—Vent connectors shall be constructed of approved metal, terra cotta, cement, glazed sewer, asbestos cement or other corrosion-resistive, noncombustible materials of sufficient thickness and low heat conductivity to withstand damage. Copper pipe shall be of not less than sixteen (16) ounce copper, monel metal of not less than No. 26 U.S. gage and galvanized steel or Alleghany iron of not less than No. 28 U.S. gage. The vent connector shall provide a rise of not less than one-quarter ($\frac{1}{4}$) inch to the horizontal foot from the appliance to the flue or vent. When a horizontal run is necessary, the length shall not exceed seventy-five (75) per cent of the height of the flue and whenever possible a vertical run shall be provided before the horizontal branch. Bends shall be avoided and connections shall be made with forty-five (45) degree elbows. The vent connector shall not be smaller than the size of the flue collar of the gas-fired equipment. Where more than one outlet is provided, the common vent connector shall equal the combined area of the outlets.

114.36. Clearances.—Gas vent connectors shall have the following minimum clearances from combustible construction:

<i>Type of Appliance</i>	<i>Clearance in Inches</i>
Boiler, warm air furnace, water and space heaters.....	6
Floor furnaces	9
Incinerators	18

114.37. Reduced Clearances.—The clearances specified in section 114.36 may be reduced as follows when the combustible construction is protected as herein provided:

<i>Type of Protection</i>	<i>Reduced Clearance</i>
$\frac{1}{4}$ -inch asbestos millboard with 1-inch noncombustible furring	6 inches reduced to 3 inches 9 inches reduced to 6 inches 18 inches reduced to 12 inches
No. 28 U.S. gage metal on $\frac{1}{4}$ -inch asbestos millboard or on 1-inch noncombustible furring	6 inches reduced to 2 inches 9 inches reduced to 4 inches 18 inches reduced to 9 inches

114.38. Unit Heaters.—Steam and hot water unit heaters shall be installed to provide clearances from combustible material of not less than one (1) inch to all heated portions thereof including the steam or hot water supply piping.

114.39. Wall Heaters.—Wall heaters shall not be located in walls or partitions of combustible construction unless tested and approved for such installation with integral insulation to prevent a temperature of more than two hundred and fifty (250) degrees F. on the exposed surface.

114.4. Location and Equipment of Heating Appliances.

114.41. Heater Room Ventilation and Air Supply.—All rooms containing heating appliances shall be provided with gravity or mechanical ventilation to prevent the accumulation of hot air over or near the appliance.

Such spaces for other than electric-fired heating appliances, shall be provided with sufficient fresh air supply to insure proper combustion. (See section 1115.4, Basic Building Code.)

114.42. Prohibited Uses.—No solid, gas or liquid fuel-fired water heaters shall be installed in normally closed bathrooms, bedrooms or other inadequately ventilated habitable spaces or in any enclosed space with a volume of less than three hundred (300) cubic feet, except as provided for approved equipment with sealed combustion chambers and direct air supply for complete combustion as specified in section 113.51; nor shall vents designed for use with gas appliances be used with solid or liquid fuel-fired heat appliances except as provided in section 113.2; nor shall a vent from any gas appliance be inter-connected with any other vent pipe.

114.43. Boiler and Furnace Location.—Boiler rooms shall not be located immediately below exitways; nor shall any floor furnace be installed in any aisle or passageway used as a means of egress. All such rooms shall be vented to the outer air by direct vent openings, noncombustible ducts or window openings with automatic protectives complying with section 119.8.

In one- and two-family dwellings, central heating plants, warm air or floor furnaces may be located in the basement or rooms on the first floor provided the appliances are mounted on noncombustible floor construction of not less than three-quarter ($\frac{3}{4}$) hour fire resistance insulated on top with not less than one-quarter ($\frac{1}{4}$) inch asbestos mill board covered with No. 24 U.S. gage metal or the equivalent. The enclosure shall be of noncombustible construction with clearances and ventilation as herein provided. Heating furnaces shall not be installed in attics except of an approved type complying with the mounting and clearance provisions of this article and provided with type B vents complying with section 113.63.

114.44. Low Pressure Steam Boilers.—Low pressure steam boilers shall be equipped with an approved safety valve, water column, try cocks, gage glass and pressure gage; and the boiler feed, drain and all other connections shall be installed in accordance with accepted engineering practice.

114.45. Low Pressure Hot Water Boilers.—Low pressure hot water boilers shall be equipped with approved water valve, altitude gage and thermometer; and the boiler feed, drain and all other connections shall be installed in accordance with accepted engineering practice.

114.46. Gravity Warm Air Furnaces.—Gravity warm air furnaces shall be encased in a double metal casing with intervening air space extending from the top of the casing down to the bottom of the fire box. The top of the bonnet shall be insulated with not less than three (3) inches of sand, or with magnesia, asbestos or other noncombustible material on top of the bonnet. They shall be equipped with automatic controls to shut off the fuel supply when the temperature in the warm air pipe at a point within twenty-four (24) inches of the furnace exceeds two hundred and fifty (250) degrees F. Wall and ceiling clearances of gravity hot air furnaces shall comply with the requirements of section 114.3.

114.47. Floor Furnaces.—The outlet temperature of warm air floor furnaces shall be not greater than two hundred and fifty (250) degrees F. unless such installation is specifically approved. No floor furnace shall be placed closer than six (6) inches to the nearest wall of combustible

construction. Floor furnaces shall not be installed in any corridor, aisle or passageway used as an exitway, nor shall such furnace extend below the floor into a garage or other space used for the storage of flammable materials unless enclosed in a metal enclosure of not less than No. 22 U.S. gage steel plate vented to the outer air. Only a gas-fired floor furnace shall be installed above the first story of a building and then only when the furnace assembly projects below the floor into a non-habitable space enclosed in three-quarter ($\frac{3}{4}$) hour fire-resistive partitions with adequate direct air supply and means of access for purposes of servicing.

114.48. Gas-Fired Boilers and Furnaces.—All gas-fired boilers and furnaces shall be equipped with approved safety devices and controls to limit the temperatures and pressures of steam, water or air in accordance with the manufacturer's approved specifications and to automatically shut off or throttle the gas supply in the event of low water or of excess steam in vapor boiler systems.

114.49. Flexible Connections.—All flexible connections in gas-fired equipment shall be made with approved semi-rigid metallic tubing and fittings. No appliance equipped with a control valve which permits complete shut-off of the gas supply shall be connected with rubber hose or similar flexible tubing (see section 117.95); except portable appliances used in commercial construction or industrial operations. (See section 1129, Basic Building Code.)

114.5. Mechanical Warm Air Furnaces and Heating Systems.

114.51. Automatic System.—The furnace of an automatically fired warm air heating system which is equipped with an air circulating fan shall be provided with approved automatic control of the fuel supply whenever the temperature of the air in the furnace bonnet or at the main supply duct exceeds two hundred (200) degrees F. for low temperature systems or two hundred and fifty (250) degrees F. for high temperature systems.

114.52. Stoker Firing.—When the furnace is stoker fired, it shall be equipped with an automatic over-run control to start the fan when the air in the furnace bonnet or at the main supply duct reaches the temperatures prescribed in section 114.51 after the stoker and fan have shut down in normal operation.

114.53. Non-Automatic System.—In a system which it not automatically fired and which is not equipped with an approved temperature limit control, the dampers and shutters shall not be capable of shutting off more than eighty (80) per cent of the total duct area; or in lieu thereof one register or grille shall be installed without a closeable shutter, and the duct leading thereto shall be installed without a damper.

114.54. Registers.—When a register is located in a floor or wall of combustible construction, the register box shall be covered with twelve (12) pound asbestos paper, and a clear space of not less than five-sixteenth ($\frac{5}{16}$) inch shall be left between the sides of the box and any combustible material. When a register is installed in the floor over the furnace, the register box shall be of double construction, with an intervening air space of not less than four (4) inches, except when the warm air duct is surrounded by a cold air passage.

114.55. Air Recirculation.—No return duct of a mechanical circulation warm air system shall be permitted from a kitchen, bathroom, garage, or other space in which flammable or noxious vapors may be present; nor

shall the recirculation of air from one dwelling unit be permitted to another dwelling unit.

114.6. Steam and Hot Water Piping.

114.61. Steam Pipes.—High pressure steam pipes shall have a minimum clearance of one (1) inch from all combustible material and when such pipes pass through combustible floors or partitions the openings shall be protected by metal or other approved noncombustible sleeves, and the open sleeve space shall be filled with noncombustible materials.

114.62. Insulation of Pipes.—All coverings or insulation used on steam and hot water pipes shall be of approved noncombustible materials; and where such pipes pass through stock shelving or are in close proximity to other combustible materials the insulation shall be not less than one (1) inch thick. They shall be installed to provide for all expansion and contraction due to temperature changes and all concealed heating pipes located in exterior walls shall be protected against freezing.

114.7. Oil Burners.

114.71. Permits.—Before any oil burning installation of more than six (6) gallons fuel capacity is placed in operation, a special permit shall be secured from the building official. No permit shall be required for the installation and use of portable burners or the type commonly used for household purposes which do not require a flue connection including oil stoves, oil heaters, and oil lamps equipped with a woven wick or for such portable apparatus as blow torches, soldering pots and tar and bitumen heaters required in construction operations.

114.72. Identification.—Each approved burner shall have permanently and prominently affixed thereto a metal plate, tag, or other approved device which certifies that it has been tested and approved by an accredited testing laboratory. Said certification shall also bear the manufacturer's or distributor's name, the number of the appliance, the hourly B.T.U. output rating; and the grade of fuel oil for which it is approved.

114.73. Instructions.—When installed, each burner shall be accompanied by complete printed instructions for igniting, operating, maintenance and shut-down procedure which shall be attached in a convenient location accessible to the installation.

114.74. Safety Devices.—Each burner shall be provided with approved safeguards and protective devices for control of the oil supply, the mixing of the air, the ignition, oil pressure or high temperature limits, high and low water limits and for control of the burner when ignition fails. There shall also be provided a means of shutting off the burner from a conveniently safe point just inside or outside of the room where the boiler is located. Draft control shall be accomplished through an automatically operated stabilizer and no smokepipe dampers shall be installed with an automatic heating unit.

114.75. Tests.—When assembled, each burner shall be tested for defects and for proper functioning throughout the operating range.

114.76. Quality and Grade of Oils.—Oil for use in oil burners shall be of approved commercial standards and shall be free from acid, grit, fibrous and other foreign matter, with a flash point not lower than one hundred (100) degrees F. The use of crankcase refuse oil in oil-fired heating equipment shall be prohibited.

114.8. Fuel Oil Tanks.

114.81. Tank Construction and Identification.—A tank for the storage of six (6) gallons or less of oil shall be considered an integral part of the burner installation; and shall be included in the approval of the burner. All tanks of more than six (6) gallons capacity shall be constructed of tank steel plates of approved quality and thickness either welded, riveted and caulked or riveted and welded to meet test requirements. Interior small storage tanks may be constructed of other materials than steel when tested and approved to withstand a hydrostatic pressure of twenty-five (25) pounds per square inch. At the time of installation, all storage tanks shall have permanently and prominently affixed thereto a metal plate or tag bearing the name of the tank manufacturer, the gage thickness of the material of which the tank was constructed, the minimum weight of the tank and its capacity and certifying that it has been tested and approved.

114.82. Tank Vents.—All fuel oil storage tanks shall be equipped with an approved vent arranged to discharge to the open air. The vent openings and vent discharge shall be designed to prevent abnormal pressure in the tank during filling, but in no case shall such vent be less than one and one-quarter ($1\frac{1}{4}$) inch pipe size. The outlet from the vent pipe shall terminate outside the building with the discharge end and located not less than two (2) feet vertically and horizontally from any window, skylight or roof structure opening in the same or any adjoining buildings and not more than twelve (12) feet above the fill pipe terminal. The top of such vents shall be protected with a weatherproof hood.

114.83. Emergency Pressure Relief.—Unless specifically exempted, all exposed fuel oil tanks shall be provided with an approved device for releasing excessive internal pressure in the event of fire.

114.84. Interior Storage Tanks.—Small storage or auxiliary tanks with a capacity of not more than two hundred and seventy-five (275) gallons may be installed above ground in the lowest story of a building, when mounted on substantial noncombustible supports and located at least seven (7) feet from any boiler, furnace, stove or exposed flame. Not more than two (2) such tanks shall be connected to any one burner, nor shall more than two (2) tanks of two hundred and seventy-five (275) gallons capacity each be installed in any one building unless protected as provided for large tanks. Tanks of more than two hundred and seventy-five (275) gallons capacity located within a building shall be installed on the lowest floor, protected with a reinforced concrete or masonry jacket; or buried with the top not less than two (2) feet below the floor level; or covered with a reinforced concrete slab not less than four (4) inches thick. Storage tanks buried in the ground shall be constructed of tank steel plates not less than one-quarter ($\frac{1}{4}$) inch in thickness and shall be located not less than three (3) feet from any foundation wall or footing. The aggregate total capacity of storage tanks located within a building or structure shall be not more than twenty thousand (20,000) gallons.

114.85. Exterior Storage Tanks.—A storage tank above ground outside a building shall be located not less than one and one-quarter ($1\frac{1}{4}$) tank diameters, but in no case less than ten (10) feet, from interior lot lines or from the nearest building or from any other tank. The capacity shall be limited by location in respect to property lines as specified in table 18. All exterior storage tanks above ground of more than ten thousand (10,000) gallons capacity shall be electrically grounded and shall be protected by

an embankment or dyke with an enclosed volume of not less than one and one-half ($1\frac{1}{2}$) times the capacity of the tank. The height of the dyke shall be not more than one-quarter ($\frac{1}{4}$) the height of the tank, but in no case less than four (4) feet. Underground tanks shall be anchored to a foundation of sufficient weight to prevent floating when necessary due to ground water conditions.

TABLE 18.—CAPACITY OF EXTERIOR FUEL OIL TANKS

Distance from lot lines in feet	Maximum capacity in gallons
25	16,000
30	24,000
40	36,000
50	48,000
60	60,000
70	96,000
85	100,000

114.9. Water Heaters.—(See section 117.7.)

All range boilers, hot water heaters and hot water storage tanks shall be equipped with temperature limit controls and pressure relief valves as herein required.

114.91. Range Boilers and Hot Water Heaters.—All range boilers, hot water heaters and storage tanks shall be equipped with approved temperature controls and pressure relief valves.

114.92. Automatic Hot Water Supply.—Automatic or remote control ignition equipment on domestic hot water heating devices using gas or liquid fuel shall be installed only in connection with a burner equipped with a safety pilot or other approved device arranged to automatically shut off the fuel supply to the main burners, if the pilot flame is extinguished. All gas water heaters with an automatic remote-control pilot, or with means of lighting other than a manual method, shall be equipped with approved down draft diverters on the flue pipe from the heater arranged to prevent extinguishment of the pilot or heating flame.

114.93. Direct-Fired Gage Equipment.—Approved relief valves and pressure gauges shall be installed in all direct-fired cast-iron water heaters with cored sections, and in all heaters with a check valve located between the water meter and the heater or tank.

114.94. Pressure Relief Valves.—The rate of discharge of pressure valves shall limit the pressure rise to ten (10) per cent of the pressure at which the valve is set to open for the manufacturer's specified heat input.

114.95. Temperature Relief Valves.—Temperature relief valves shall be capable of discharging sufficient hot water at two hundred and ten (210) degrees F. without any further rise in temperature.

114.96. Vacuum Relief Valves.—All copper tanks shall be equipped with approved vacuum relief valves.

114.97. Relief Outlet Wastes.—The size of relief outlet waste valves shall be not less than the cross-sectional area of the valve discharge outlet. No pressure, temperature or other type relief valve shall discharge directly to the building drainage system. (See section 117.3.)

SECTION 115.0. REQUIREMENTS FOR LIGHT AND VENTILATION

115.1. Natural Light and Ventilation.—Every habitable and occupiable room or space shall be provided with windows, skylights, monitors, glazed doors, transoms, glass-block panels or other light and air transmitting media opening to the sky or to a public street, or to a legal yard, court or other unoccupied space on the same lot with the building, complying with the provisions of this code, so arranged to provide as uniform distribution of light and fresh air as practicable of the intensity and quantity herein prescribed. Rooms used for other than residence purposes may be provided with the alternate artificial lighting and mechanical ventilation specified in section 115.2.

115.11. Standard of Natural Light.—In the application of the provisions of this code, the standard of natural light shall be deemed an average illumination equal to six (6) foot candles as uniformly distributed as practicable on every part of the room area at a height of thirty (30) inches above the floor level.

115.12. Standard of Natural Ventilation.—In the application of the provisions of this code, the standard of natural ventilation in all habitable spaces shall be based upon a volume of four hundred (400) cubic feet of air per occupant, with the accessory windows or other ventilating devices located in the exterior walls or on the roof of the building for fresh air supply.

115.13. Window Size.—In all rooms and spaces used for residence purposes, windows and exterior doors may be used as a natural means of light and ventilation, and when so used their aggregate glass area shall amount to not less than one-tenth ($1/10$) of the floor area served, and with not less than one-half ($1/2$) of this required area available for unobstructed ventilation.

115.14. Rooms Below Grade.—No room which has less than one-half ($1/2$) of its height above the finished grade shall be occupied as a habitable room. The provisions of this section shall not be construed to prohibit play, recreation or similar rooms at a greater depth below grade.

115.15. Bath and Toilet Rooms.—Every required bath and toilet room shall be ventilated as herein prescribed: by windows opening to the outer air as specified in section 115.13 but in no case less than three (3) square feet in area; by windows opening on a vent shaft with a cross-sectional area of one (1) square foot for each foot in height, but not less than nine (9) square feet in area, open at the top or constructed with equivalent side louvre openings; by vents or ducts of steel or other noncombustible material complying with tables 15 and 16 of adequate height to insure a minimum supply of two (2) cubic feet of air per square foot of floor area per minute, but not less than one-half ($1/2$) square foot in cross-sectional area and one-third ($1/3$) additional square foot for each additional water closet or urinal above two (2) in number; by a skylight of approved noncombustible construction not less than three (3) square feet in area with ventilating openings; or for other than one- and two-family and multi-family dwellings, by a system of mechanical ventilation or gravity ventilator with an approved siphon-type hood, capable of exhausting forty (40) cubic feet of air per minute in public bathrooms and not less than

twenty-five (25) cubic feet of air per minute in private bathrooms.

115.17. Alcove Rooms.—Alcove rooms shall open without obstruction into adjoining rooms and the required light and air shall be based upon the combined floor area. No such alcove space shall be more than sixty (60) square feet in area and the opening to the adjoining rooms shall be not less than eighty (80) per cent of the superficial area of the division wall.

115.18. Institutional Buildings.—In buildings of the institutional use group, every habitable and occupiable room shall be provided with light and ventilation as required in this code for residence uses; except that in buildings for the enforced detention of people, indirect openings to the street or court may be permitted through intermediate corridors or by other approved mechanical and artificial means.

115.19. Places of Public Assembly.—All places of public assembly during occupancy shall be illuminated by sufficient natural or artificial light to permit the reading of an ordinary newspaper. When natural light and ventilation are provided, the required openable window area or other approved devices for natural light and ventilation shall be distributed as uniformly as practicable on at least two (2) sides of the room.

115.2. Artificial Light and Ventilation.—When natural light and ventilation are inadequate to insure the health and safety of human occupants, or when the use and occupancy of a building or part thereof involve the presence of dust, fumes, gases, vapors or other noxious or deleterious impurities that create a fire or health hazard, such building shall be equipped with artificial light and mechanical ventilation as herein provided.

115.21. Intensity of Illumination.—The intensity of illumination of habitable and occupiable rooms shall be equivalent to six (6) foot candles as specified in section 115.11, and of bath and toilet rooms equivalent to three (3) foot candles. All areas and portions of buildings used as places of public assembly other than theaters shall be lighted by electric light to provide a general illumination of not less than one (1) foot candle.

115.22. Mechanical Ventilation.—Where mechanical ventilation is accepted as an alternate for natural means of ventilation or is required under the provisions of this code, equipment and distribution shall comply with section 118, and such systems shall be kept in operation at all times during normal occupancy of the building, room or space so equipped. Mechanical or gravity systems of ventilation shall provide the minimum fresh air supply in cubic feet per minute per square foot of floor area prescribed in table 19.

TABLE 19.—REQUIRED MINIMUM FRESH AIR SUPPLY

Use of room or space	Number of air changes per hour	Cubic feet per minute per square foot
Auditoriums and public assembly	6	1½-2
Bath and toilet rooms		
private	5	1
public	6	2
Convention halls	6	2
Dance halls	6	2
Interior cooking spaces	6-8	2-3
Institutional		
ward and class rooms	4	1½
operating rooms	10	5
Kitchens		
private	3	1-1½
public	8	3
Living and bed rooms	2	½
Locker and rest rooms	4	1½
Offices and jails	2	½
Work rooms		
Under 1000 cubic feet per individual	4	1½
1000 cubic feet or more per individual	2	½

115.3. Attic Spaces.—All attic spaces and unoccupied spaces between roofs and top floor ceilings shall be ventilated by not less than two (2) opposite louvres or vents with a total clear area of opening not less than one-third ($\frac{1}{3}$) of one (1) per cent of the horizontally projected roof area.

115.4. Crawl Spaces.—Access spaces under grade floor construction and wherever wood, gypsum, metal or other floor construction subject to corrosion or deterioration is installed above the ground without basements shall be provided not less than eighteen (18) inches in depth. Such spaces shall be vented with screened openings having a clear area of not less than one-third ($\frac{1}{3}$) of one (1) per cent of the enclosed building area or shall be provided with other equivalent means of artificial ventilation. The screens shall be corrosion-resistive and rodent-proof complying with section 116.43. When floating mat foundations are provided in accordance with section 110.3, the requirement for ventilation shall not apply.

115.5. Stairways and Exitways.

115.51. Illumination.—All stairways, exitways and passageways appurtenant thereto in other than one- and two-family dwellings shall be equipped with artificial lighting facilities to provide an intensity of illumination of not less than three (3) foot candles at all times that conditions of occupancy of the building require the exitways to be available.

115.52. Multi-family and Institutional Buildings.—In multi-family buildings and in institutional buildings for the care, treatment or education of people, required interior stairways and the hallways shall be provided with windows having a glass area of not less than ten (10) square feet which open on a street, alley, yard or court or with the equivalent source of light for each story through which the stairway passes. Windows in hallways shall be so located that light penetrates the full length of the hallway.

115.6. Courts.—Every court which serves windows for light and ventilation shall have a minimum width of three (3) inches for each foot of height or fraction thereof but not less than five (5) feet for outer courts and twice these values for inner courts. Gore courts shall be not less than five (5) feet wide at any point. All courts required for light and ventilation shall be located on the same lot with the building or structure served thereby.

115.7. Rear Yards.—The depth of a rear yard required for light and ventilation for buildings of the residence use group shall not be less than fifteen (15) feet for a height of not more than thirty-five (35) feet and shall increase four (4) inches in depth for each additional foot in height; except that for a corner lot the minimum depth shall be not less than ten (10) feet; and when the lot is less than sixty-five (65) feet in depth, the required depth of the rear yard may be decreased six (6) inches for each foot less than sixty-five (65) feet. For buildings of all other use groups, the minimum depth of a required rear yard shall be not less than ten (10) feet.

115.8. Motor Vehicle Parking.—Court and yard areas may be used for automobile parking spaces or private garages not more than one (1) story in height, when accessory to and only for the use of the occupants of the building; provided that no such parking space or accessory building shall be located within five (5) feet of a required window opening in the main building.

115.9. Shaft Enclosures.—All vertical shafts, other than stairway enclosures, extending through more than one (1) story of a building or structure including dumbwaiter and elevator hoistways shall be enclosed in fire-resistive construction complying with the requirements of table 5 of the Basic Building Code (see appendix E) and shall be vented as herein specified with skylights, windows or ducts opening to the outer air or with other equivalent means of ventilation.

115.91. Open Shafts.—The enclosing walls of shafts for light and ventilation purposes that are open to the outer air at the top shall be constructed as provided for exterior enclosure walls in section 112.

115.92. Covered Shafts.—The enclosing walls and the top of interior covered shafts shall be constructed of approved masonry walls or other assemblies having a fire-resistance rating of not less than two (2) hours, except as provided in section 115.93.

115.93. One- and Two-Family Dwellings.—In one- and two-family dwellings which are not more than two and one-half ($2\frac{1}{2}$) stories in height of other than fire-resistive construction, interior shafts shall be supported and constructed with materials having a fire-resistance rating of not less than three-quarter ($\frac{3}{4}$) hour and shall in all cases extend not less than three (3) feet above the adjoining roof.

115.94. Enclosure of Tops of Shafts.—All shafts and hoistways, except those for elevators and dumbwaiters, that extend to the roof of a building or structure shall be covered at the top with a skylight of at least three-quarters ($\frac{3}{4}$) the area of the shaftway constructed of approved noncombustible materials and glazed with not less than three-sixteenths ($\frac{3}{16}$) inch plain glass protected with non-corrosive, noncombustible screens above and below. The skylights herein required may be replaced by one or more side windows of equivalent area provided the sill is not less than two (2) feet above the adjoining roof and the opening is not located on the lot line or within twenty (20) feet of an opening in adjacent wall.

All shafts, except those for elevators and dumbwaiters, that do not extend into the top story of a building or structure shall be enclosed at the top with construction of the same strength and fire resistance as the con-

struction type in which it occurs, but in no case less than that of the required fire-resistance rating of the shaft enclosure. Such shafts shall be provided with gas and smoke relief ducts or vents or approved mechanical means of ventilation in conformity to the provision of section 118.

115.95. Elevator and Dumbwaiter Shafts.—Elevator and Dumbwaiter shafts shall be vented as required in article 16 of the Basic Code.

115.96. Bottom Enclosures.—All shafts that do not extend to the bottom of the building or structure shall be enclosed at the lowest level with construction of the same strength and fire resistance as the lowest floor through which it passes, but in no case with a fire-resistance rating less than that of the shaft enclosure.

115.97. Thermostatic Control.—In other than one- and two-family dwellings, the skylights, windows and other vent relief devices, in shafts other than those for elevators and dumbwaiters, shall be controlled by fusible links designed to operate at a fixed temperature of not more than one hundred and sixty (160) degrees F.; or by electric or pneumatic operation under a rapid rise in temperature at a rate of fifteen (15) to twenty (20) degrees F. per minute; or by other equivalent approved methods.

115.98. Existing Shaftways.—In all existing shaftways in buildings of the multi-family and hotel use groups, the institutional use group and assembly use group, and all buildings with an occupancy load of more than seventy-five (75) above or more than forty (40) below grade, which are not already enclosed as herein required, the building official shall direct such construction as he may deem necessary to insure the safety of the occupants.

SECTION 116.0. WATERPROOFING, RATPROOFING AND TERMITE PROTECTION

116.1. Foundation Walls and Cellar and Basement Waterproofing.—Where habitable and occupiable rooms are located below grade and when required by the physical topography and the ground water conditions, foundation walls below the ground level, and the basement floor of all buildings in the residential and institutional use groups shall be damp-proofed and where necessary adequately reinforced to withstand hydrostatic pressure and to insure a dry basement.

116.2. Foundation Wall Reinforcement.—When required by lateral water pressure, the reinforcement of eight (8) inch concrete basement walls supported laterally at the top and bottom shall consist of not less than one-half ($\frac{1}{2}$) inch round verticals spaced twelve (12) inches on centers and one-half ($\frac{1}{2}$) inch round horizontals spaced twenty-four (24) inches on centers. For all conditions of support, the reinforcement shall be determined by accepted engineering analysis.

116.3. Soil Drainage.—When required by soil conditions, sub-surface drainage shall be provided under the foundation slab in conformity to section 110.8.

116.4. Ratproof Apron.

116.41. Grade Protection.—Where local conditions require protection against rats or other rodents, the exterior walls at and near grade of all buildings and structures enclosing habitable or occupiable rooms and spaces in which persons live, sleep or work, or in which foodstuff or food is stored, prepared, processed, served or sold, shall be constructed or chemically or otherwise treated or assembled of component materials to be rat- and vermin-proof. When not provided with a masonry foundation wall, a continuous apron of masonry or concrete not less than four (4) inches thick or of other water-resistant material of equal strength shall be installed around the entire perimeter of the building.

116.42. Height of Apron.—The apron shall extend sufficiently above grade to provide protection against the average snowfall in the locality, but not less than eight (8) inches above and twenty-four (24) inches below grade level; but, if serving as a load bearing foundation wall, to sufficiently greater depth to assure protection from frost action as provided in section 110.

116.43. Protection of Wall Openings.—All openings in the apron required for ventilation in section 115.4 or for other purposes shall be guarded with corrosion-resistive rodent-proof shields of not less than No. 22 gage perforated steel sheets or No. 20 B&S gage aluminum or No. 16 gage expanded metal or wire mesh screens with not more than one-half ($\frac{1}{2}$) inch mesh openings.

116.44.—Protection of Grade Floor Slab Openings.—Exterior walls shall be effectively tied to the slab without open spaces between slab and walls. All access openings in the slab shall be closed with concrete, masonry, metal or other corrosion-resistive noncombustible covers of adequate strength to support the the floor loads. Pipe, conduit, cable and similar openings shall have snugly-fitting collars to eliminate all open spaces.

116.45. Wall Chases.—The backs and sides of chases in exterior walls including recessed apron walls shall be made water-tight and when less than eight (8) inches of masonry is exposed to the weather, it shall be waterproofed with a mastic membrane, cement coat or other approved method.

116.5. Protection of Lumber.

116.51. Grade Construction.—All untreated wood in exterior walls at grade shall be supported on concrete or other masonry walls or piers laid in cement mortar and, where required, all wood shall be impregnated with approved preservative and termite-proof treatments.

116.52. Wall Pockets.—Wood girders framing into masonry walls shall have one-quarter ($\frac{1}{4}$) inch air spaces on both sides and ends for ventilation purposes or otherwise protected with approved preservative treatments.

116.53. Columns.—No wood posts shall be used in damp locations in cellars or basements or below grade level except when approved pressure-treated materials are used, or adequate ventilation is provided to prevent decay. All untreated wood posts shall rest on concrete pedestals as provided in sections 111.4 and 116.51. When pressure treated with an approved preservative, in accordance with standards for pressure treatment and preserving of lumber listed in appendix B, wood posts and columns may extend into the soil.

116.6. Termite Protection.—Where protection against termites and other wood destroying insects is required by local conditions, metal shields of unpierced aluminum, copper, galvanized steel of not less than No. 26 U. S. gage or its equivalent or of other corrosion-resistive materials shall be bedded continuously in cement mortar on top of masonry walls extending not less than two (2) inches beyond the face of the wall and bent downward at an angle of forty-five (45) degrees to form a protecting hood. When approved pressure-treated material is used for the sill, the metal shield may be omitted. The sill shall be bedded in cement mortar as required in section 111.69 and preservatives and methods of treatment shall conform to the standards for pressure treatment and preserving of lumber listed in appendix B.

116.7. Removal of Building Debris.—No loose wood, form material or other debris subject to decomposition shall be buried or left under floors, porches, or around foundation walls.

SECTION 117.0. PLUMBING, WATER SUPPLY AND GAS PIPING

117.1. Standard of Accepted Engineering Practice.—The design and installation of plumbing systems, including sanitary and storm drainage, sanitary facilities, water supplies and storm water and sewage disposal in buildings shall comply with the following sections 117.5 through 117.9 and accepted engineering practice as defined in the National Plumbing Code listed in appendix B.

Installation of gas piping conforming to the applicable requirements of the standards for installation of gas piping and gas appliances listed in appendix B shall be accepted as complying with the requirements of the Abridged Code.

117.2.—Deleted.—No requirements.

117.3.—Deleted.—No requirements.

117.4.—Deleted.—No requirements.

Table 20.—Deleted.

117.5. Sanitary Fixtures.—Every building and structure designed for human occupancy and every construction operation shall be provided with a sufficient number of approved fixtures located and installed as required by this code for the removal of human excreta and other wastes, for the purpose of cleansing persons, apparel or utensils and for providing potable water supplies.

117.51. Number of Fixtures.—The number of water-flushed toilet fixtures required for each sex shall be not less than specified in tables 21 and 22; and the requirements shall be separately computed on the basis of the maximum number of persons of each sex having access at any time to such facilities on the premises for which they are furnished.

**TABLE 21.—MINIMUM NUMBER OF SANITARY FIXTURES FOR ALL USE GROUPS
OTHER THAN RESIDENTIAL AND ASSEMBLY**

Occupancy load	Waterclosets	Lavatories
1-15	1	1
16-50	3	2
51-75	4	2
76-100	5	3
101-150	7	4
151-200	8	4
Over 200	1 for each 30 additional occupants	1 for each 60 additional occupants

**TABLE 22.—MINIMUM NUMBER OF SANITARY FIXTURES
FOR ASSEMBLY USE EXCEPT SCHOOLS, COLLEGES AND CHURCHES**

Occupancy load	Waterclosets	Lavatories
1-100	3	2
101-250	6	3
251-500	8	4
501-1000	12	6
1001-1500	15	8
1501-2000	17	9
Over 2000	1 for each 200 additional occupants	1 for each 400 additional occupants

117.52. Credit for Urinals.—The number of urinals required for men shall be not less than one-third ($\frac{1}{3}$) of the number of required watercloset fixtures. When provision is made for more than thirty (30) males, a credit of one (1) watercloset will be allowed for each urinal furnished.

117.53. Hotels and Dormitories.—In hotel and dormitory residential buildings (use group L-1), there shall be not less than one (1) toilet room for each sex for every six (6) sleeping rooms, and there shall be not less than one (1) watercloset, one (1) lavatory, and one (1) tub or shower bath for every six (6) persons or part thereof for whose use it is intended in each toilet room. The toilet room shall be readily accessible and in no case more remote than one (1) floor above nor more than one (1) floor below the location of the sleeping rooms for which it is designed.

117.54. Single and Multi-Family Dwellings.—In one- and two-family and multi-family dwellings (use groups L-2 and L-3), there shall be provided in each dwelling unit one (1) toilet room and one (1) kitchen sink located in separate rooms. The toilet room shall contain not less than one (1) watercloset, one (1) lavatory and one (1) tub or shower bath.

117.55. Schools and Colleges.—In school buildings (use group F-4), with an occupancy load of two hundred (200) or less, the provisions of table 21 shall apply. When designed for a greater occupancy load, there shall be at least one (1) toilet fixture for each forty (40) pupils; and in boys' toilet rooms not less than one-fourth ($\frac{1}{4}$) of the fixtures shall be waterclosets.

117.56. Churches.—In church buildings (use group F-4) not less than one (1) toilet fixture shall be provided for each one hundred (100) occupants of each sex; and at least one-third ($\frac{1}{3}$) of the fixtures for the male sex shall be urinals to comply with section 117.52.

117.57. Bath and Toilet Room Enclosures.—All bath and toilet rooms shall be enclosed in walls or partitions for full story heights; or in lieu thereof shall be provided with an independent ceiling having a clear height of not less than seven (7) feet four (4) inches; except as provided for auxiliary toilets in one- and two-family dwellings. In all buildings, other than residential buildings, toilet installations shall afford individual privacy by means of partitions between waterclosets, provided with latched doors for individual compartments so arranged as to permit free circulation of air throughout the toilet compartments; and the doorway shall be installed to screen the inside of the toilet room. Where more than one (1) watercloset is required, separate toilet rooms shall be provided for each sex.

117.58. Auxiliary Toilets.—In one- and two-family dwellings, an auxiliary toilet compartment may be installed in the basement enclosed in approved dwarf partitions.

117.59. Materials of Construction for Fixtures and Connections.—Water-flush closets, urinals, and other receptacles for the disposal of human excreta shall be made of vitreous earthenware, or cast iron with porcelain-enameled interior surfaces or of other approved impervious and sanitary materials. Kitchen sinks for dishwashing and culinary purposes shall be made of approved corrosion-resistive and non-absorbent materials and shall be installed so that the space underneath each fixture is readily accessible for inspection and cleaning. All approved plumbing fixtures and devices shall be connected and installed as provided in this code and the approved standards; and no fixture or device shall be indirectly connected to the plumbing or drainage system when such connection would be detrimental to the public health or to the occupants of the building or structure. The unit rating or fixture equivalent of all plumbing fixtures shall be used to determine the size of wastes, vents and traps as specified in table 23.

TABLE 23.—FIXTURE EQUIVALENTS

Type of fixture	Unit rating		Size of trap and fixtures in inches
	Private use	Public use	
Refrigerator or ice box.....	$\frac{1}{2}$	1	$1\frac{1}{4}$
Sterilizer ($\frac{1}{2}$ " waste).....	$\frac{1}{2}$	1	$1\frac{1}{4}$
Drinking fountain.....	1	1	$1\frac{1}{4}$
Dental or fountain cuspidor.....	1	1	$1\frac{1}{4}$
Lavatory or wash basin.....	1	2	$1\frac{1}{4}$
Swimming pool for each 1000-gallon capacity.....	1	2	$1\frac{1}{2}$
Urinal trough for each 2 feet.....	1	2	$1\frac{1}{2}$
Lavatory, multiple.....	2	4	$1\frac{1}{2}$ & 2
Bath tub and similar fixtures.....	2	4	$1\frac{1}{2}$ & 2
Shower stall and shower bath.....	2	4	$1\frac{1}{2}$ & 2
Laundry tray.....	2	4	$1\frac{1}{2}$
Floor drain.....	2	2	$1\frac{1}{2}$
Floor drain, rim flush.....		3	2
Sink other than slop sink.....	2	4	$1\frac{1}{4}$ & $1\frac{1}{2}$
Slop sink.....		3	2
Sink, flushing rim and valve.....		10	3
Combination fixture.....	2	3	$1\frac{1}{2}$
Shower stall, multiple spray.....		4	2
Urinal stall.....	3	5	$1\frac{1}{2}$ & 2
Hose connection.....	3	5	$1\frac{1}{2}$ & 2
Sump (24" diameter).....	4	4	2
Urinal, siphon jet or pedestal.....	6	10	2 & 3
Bath tub or shower.....	6	12	2 & 3
Bath room group, bath tub and shower.....	8	8	3
Water closet, bed pan washer and similar fixtures.....	6	12	3

117.6. Soil and Fixture Traps and Vents.—Each plumbing fixture shall be separately trapped as near to such fixture as possible, except as provided herein. All traps shall be self-cleaning and shall be designed to hold a minimum water seal of two (2) inches. Such traps shall have the same nominal inside diameter as the drain or waste pipe connecting thereto, and shall be provided with an approved cleanout. They shall be vented to insure complete air circulation and to protect against siphonage and back pressure; except that no vents will be required on down spouts, rain leaders, back-water or sub-soil catch-basin traps, or on floor-drain traps when connected to the storm water drain on the building side of a building trap. No fixture, plumbing waste, soil line or storm drain, or any combination thereof, shall be double trapped; except that a building trap when used shall be exempt from this requirement; and except further that two (2) single compartment laundry trays, a combination sink and laundry tray, or one (1) double compartment laundry tray or sink may be connected into a single trap.

117.61. Main Building Trap.—In localities subject to prolonged periods of freezing temperatures or where the public sewer or septic tank or other sewage disposal system due to inadequate capacity or otherwise requires additional safeguards against the diffusion of sewer air into the building or structure in which plumbing fixtures or leaders are installed, such buildings or structures may be provided with a main building trap or equivalent device. When used, such building trap shall be located in the main building drain inside of the property line near the front wall of the structure and on the sewer side of all plumbing connections; and shall have a fresh air inlet pipe of not less than one-half ($\frac{1}{2}$) the diameter of the building drain discharging through the trap; except that the discharge from a sewer-lift, oil separator, blow-off pipe or from rain water leaders may connect on the outside of the main trap.

117.62. Storm Water Trap.—All storm water drains shall be trapped before entering any combined sewer, building sewer or main building drain which is designed to carry sewage; but no trap shall be required for storm water drains which are connected to a sewer exclusively discharging storm water. In no case shall the storm water trap be omitted from garages, gasoline stations or other buildings, structures or premises from which flammable or explosive liquids or other hazardous wastes may discharge into the storm drain or building sewer.

117.63. Back-Water Trap.—When subject to back-flow, flooding or other flow interference, drains, building sewers and storm sewers shall be provided with back-water valves, traps or other equivalent approved devices.

117.64. Size and Length of Vents.—The diameter of an individual vent shall be not less than one-half ($\frac{1}{2}$) the diameter of the drain to which it connects but in no case less than one and one-quarter ($1\frac{1}{4}$) inches in diameter. Main vents and vent stacks shall be not less than one-half ($\frac{1}{2}$) the diameter of the soil or waste stack and the permissible length shall be limited by the number of fixture units vented thereby as prescribed in table 25.

117.65. Distance of Vent from Trap.—The permissible length of branch drains to vent shall be determined by the slope and size of fixture as regulated by table 24. The developed length of a branch drain permissible with-

out venting shall be not more than eight (8) feet; except that the building official may permit fifteen (15) feet on a branch drain from a surgical operating table or fixtures for similar uses.

TABLE 24.—LENGTH OF BRANCH DRAIN TO VENT
In feet

Size of fixture in inches	Sanitary tee		Long turn TY or combination Y and $\frac{1}{8}$ bend	
	$\frac{1}{4}$ " slope	$\frac{1}{2}$ " slope	$\frac{1}{4}$ " slope	$\frac{1}{2}$ " slope
$1\frac{1}{4}$	4	$2\frac{1}{2}$	$1\frac{1}{2}$	1
$1\frac{1}{2}$	$4\frac{1}{2}$	3	4	2
2	5	4	4	4
3	6	6	6	6
4	8	8	8	8

TABLE 25.—MAXIMUM LENGTH OF VENTS
In feet

Size of soil or waste in inches	Number of fixture units	Size of vent in inches								
		$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	4	5	6	8
$1\frac{1}{4}$	2	75	—	—	—	—	—	—	—	—
$1\frac{1}{2}$	8	70	150	—	—	—	—	—	—	—
2	12	30	75	310	—	—	—	—	—	—
2	24	28	70	300	—	—	—	—	—	—
$2\frac{1}{2}$	42	—	35	140	450	—	—	—	—	—
3	30	—	20	80	260	650	—	—	—	—
3	60	—	18	75	240	600	—	—	—	—
4	100	—	—	35	100	260	1100	—	—	—
4	250	—	—	30	95	240	1000	—	—	—
4	500	—	—	22	70	180	750	—	—	—
5	550	—	—	—	28	70	320	1000	—	—
5	1100	—	—	—	20	50	240	750	—	—
6	950	—	—	—	—	20	95	240	1000	—
6	1900	—	—	—	—	18	70	180	750	—
8	1800	—	—	—	—	—	30	80	350	1100
8	3600	—	—	—	—	—	25	60	250	800
10	2800	—	—	—	—	—	—	30	80	350
10	5600	—	—	—	—	—	—	25	60	250

117.66. Location of Vents.—Except in approved watercloset and similar fixtures, the vent opening from the soil or waste pipe shall be located above the dip of the trap. Crown vents shall be prohibited. All vent stacks shall connect full size at their base to the main soil or waste pipe at or below the lowest fixture or branch and shall extend undiminished in size at least one (1) foot above the roof, except when the roof is used for purposes and uses other than as a weather covering, the vent stack shall extend to a height of not less than six (6) feet, or it may return to the main soil or waste vent at least three (3) feet above the highest fixture branch. When the main stacks are grouped into one pipe which extends through the roof, the gross area of the combined vent stack shall be not less than seventy-five (75) per cent of the aggregate areas of the connecting stack. Waste stack increases shall be provided in accordance with section 117.23.

117.67. Group Venting.—A complete bathroom unit with watercloset or a group of other fixtures located directly adjacent to each other, or when such fixtures are located back-to-back on opposite sides of a wall, may be provided with a common vent. A battery of three (3) fixtures, attached to a single soil branch or branch waste may be vented by a continuous loop

or circuit-vent. The vent connection of such loop to the branch shall be located between the two (2) fixtures most distant from the stack.

117.7. Water Supply Systems.—Every building in which people live, work or congregate shall be provided with a supply of clean, cool and potable water in sufficient quantity to maintain all water supply and plumbing fixtures in a safe and sanitary manner; and such other water supplies as may be required for fire-extinguishing, air conditioning and other service equipment of the building or structure. Minimum water supply connections shall comply with table 26. Where the required capacity of potable water supplies is available from public water mains at the site every building and structure shall be supplied from such mains to provide for all its service equipment. When public water mains are not available, a private source of water supply from drilled, driven or dug wells may be used. Such wells shall be located to avoid contamination as provided in section 117.4 and samples of the water shall be submitted periodically to the health official for analysis and approval.

TABLE 26.—MINIMUM WATER SUPPLY CONNECTIONS
Size in inches

Type of fixture	Cold water	Hot water
Lavatory.....	$\frac{3}{8}$	$\frac{3}{8}$
Soda fountain sink.....	$\frac{3}{8}$	$\frac{3}{8}$
Bath tub.....	$\frac{1}{2}$	$\frac{1}{2}$
Sink and tray.....	$\frac{1}{2}$	$\frac{1}{2}$
Dental cuspidor.....	$\frac{1}{2}$	$\frac{1}{2}$
Shower, each head.....	$\frac{1}{2}$	$\frac{1}{2}$
Wash sink, each set of faucets.....	$\frac{1}{2}$	$\frac{1}{2}$
Sink, flushing rim.....	1	$\frac{1}{2}$
pot or scullery.....	$\frac{3}{4}$	$\frac{3}{4}$
Bath room group.....	$\frac{3}{4}$	$\frac{3}{4}$
Urinal, stall.....	$\frac{3}{4}$	—
pedestal.....	1	—
trough for each 2 feet of length.....	$\frac{1}{2}$	—
Water closet, flush valve.....	1	—
Water closet, tank.....	$\frac{3}{4}$	—

117.71. Main Water Service Shut-Off.—An approved main shut-off valve shall be provided on the discharge side of the water service pipe controlling all outlets in the building.

117.72. Cross-Connections.—No cross-connection shall be made between the potable water distribution system and non-potable water supplies or any portion of waste or soil systems, nor shall fixture or devices be installed that may contaminate, pollute, or otherwise render the water unsafe. Water from unapproved sources for industrial processing or for fire protection shall be identified at each outlet with an approved sign stating that the water is unfit and that its use is prohibited for drinking purposes. Piping carrying potable waters shall be distinguished and identified from water piping from unapproved sources by distinctive painting and appropriate signs.

117.73. Supply for Multiple Fixtures.—In buildings with multiple plumbing fixtures, a residual pressure of not less than five (5) pounds per square inch at the highest fixture in the building measured on the pressure side of any wide-open faucet or supply shall be provided under conditions of simultaneous use of all such fixtures throughout multiple tenant buildings,

or in any case under the conditions of peak demand. When the water supply is used from the municipal main and is inadequate to meet this requirement, one or more approved automatically controlled pressure or gravity tanks shall be installed of sufficient capacity to supply those parts of the installation which are too high to be fed from risers directly connected to the street water main.

117.74. Water Supply Piping.—A stop and drain cock or valve shall be installed on the building side of every main supply line and on risers from pressure or gravity tanks located at or near the source. A separate accessible stop and drain cock valve shall be provided at the foot of each branch riser line for each group of fixture outlets controlled by any one tenant or for any one floor in every business and in multi-family dwellings. Each individual watercloset shall be provided with a separate shut-off valve.

117.75. Domestic Hot Water Supply Systems.—Domestic hot water boilers, range boilers and water backs of heating boilers shall be equipped with temperature, pressure and safety relief devices as provided in section 114.9. The minimum sizes of hot water piping shall comply with table 26.

117.76. Brass and Copper Pipe.—Brass pipe with threaded fittings or when used with approved welded joints shall have a copper content of not less than eighty-four (84) per cent. The minimum permissible thickness of brass and copper pipe shall comply with table 27.

TABLE 27.—MINIMUM WALL THICKNESS OF THREADED AND
WELDED BRASS AND COPPER PIPE
in inches

Diameter in inches	Threaded	Welded
$\frac{3}{8}$	0.09	0.065
$\frac{1}{2}$	0.107	0.065
$\frac{3}{4}$	0.114	0.065
$1\frac{1}{4}$	0.126	0.065
$1\frac{1}{2}$	0.146	0.065
$1\frac{3}{4}$	0.150	0.065
2.....	0.156	0.065
$2\frac{1}{2}$	0.187	0.068
$3\frac{1}{2}$	0.219	0.083
$4\frac{1}{2}$	0.25	0.095
5.....	0.25	0.107
$5\frac{1}{2}$	0.25	0.125
6.....	0.25	0.132
6.....	0.25	0.158

117.77. Copper Water Tube.—Copper water tube for use with soldered fittings shall have a copper content of not less than ninety-nine and nine-tenths (99.9) per cent. Copper water tube shall comply with table 28 for average dimensions.

117.78. Solder Joints.—Solder joints in copper tubes with approved fittings shall be cleaned bright, fluxed and soldered with approved materials complying with the applicable standards in appendix B.

117.79. Submerged Inlets.—Submerged inlets shall be prohibited; except that such plumbing fixtures in which the proper functioning does not permit an air gap adequate to prevent back siphonage shall be equipped with vacuum breakers or other approved safety devices. When back siphonage or contamination of water supplies is not otherwise provided for, water

supply inlets to all fixtures, devices, apparatus or appliances shall be located to establish an air gap of not less than two (2) times the diameter for circular openings and two and one-half ($2\frac{1}{2}$) times the square root of the area for openings of other shapes, but in no case shall such gaps be less than one (1) inch.

TABLE 28.—AVERAGE DIMENSIONS OF COPPER WATER TUBE

Water tube nominal size	Outside diameter in inches	Wall thickness in inches*		
		Type K	Type L	Type M
$\frac{3}{8}$	0.500	0.049	0.035	—
$\frac{1}{2}$	0.625	0.049	0.040	—
$\frac{5}{8}$	0.750	0.049	0.042	—
$\frac{3}{4}$	0.875	0.065	0.045	—
1.....	1.125	0.065	0.050	—
$1\frac{1}{4}$	1.375	0.055	0.055	—
$1\frac{1}{2}$	1.625	0.072	0.060	—
2.....	2.125	0.083	0.070	—
$2\frac{1}{2}$	2.625	0.095	0.080	0.065
3.....	3.125	0.109	0.090	0.072
$3\frac{1}{2}$	3.625	0.120	0.100	0.083
4.....	4.125	0.134	0.110	0.095
5.....	5.125	0.160	0.125	0.109
6.....	6.125	0.192	0.140	0.122

*Copper tubing in soil and waste systems shall be limited to type K tubing.

117.8. Drainage Systems.

117.81. Sewer Connection.—The drainage system conveying storm water from roofs, paved areas and courts, except that pertaining to private garages on the rear of lots, shall be connected to the building sewer, storm sewer, combined sewer, or other approved disposal terminal in accordance with this code; and all sub-soil drains on the same lot shall be connected to the plumbing or drainage system of the building within the lot lines.

117.82. Sump Tank.—If sub-soil drains are located below the building sewer level, the discharge shall be collected in a sump or receiving tank and shall be automatically lifted and discharged into the drainage system.

117.83. Combined Drain.—When necessary to connect sub-soil drainage into a combined drain which carries sanitary sewage, a running trap or sump with accessible cleanout shall be installed in front of the drain connection.

117.84. Floor and Roof Drains.—Each floor drain leading to a storm drain shall be trapped to comply with section 117.6 and all roof drains shall have approved strainers, except when draining to hanging gutters.

117.85. Conductors and Leaders.—Conductors or leaders shall not be used as soil, waste or vent pipes; nor shall any soil, waste or vent pipe be used as a conductor unless it is installed in accordance with this code. All conductor roof openings shall be protected with approved screens or baskets of noncombustible materials. When placed within the walls of any building or installed in an inner court or in a ventilating pipe shaft, all rain water conductors and roof leaders shall be equipped with cleanouts at their bases. Along driveways and alleyways without sidewalks, rain water leaders and conductors when not installed in wall chases shall be protected from mechanical injury by wheel guards; or such conductors shall re-enter the building at a forty-five (45) degree inclination through the wall at least ten (10) feet above the established grade. The size of

leaders and piping shall be based on the area drained thereby as provided in table 29. When the maximum rate of rainfall in any locality is more

TABLE 29.—MAXIMUM DRAINED AREA OF STORM WATER DRAINS AND LEADERS
In square feet

Size in inches	Fall per foot in inches		
	$\frac{1}{8}$ "	$\frac{1}{4}$ "	$\frac{1}{2}$ "
2	400	600	900
2½	700	900	1200
3	1100	1500	2100
4	2300	3000	4500
5	4200	6000	8500
6	6700	9500	13,500
8	14,000	20,500	29,000
10	26,500	37,000	56,000
12	43,000	60,000	85,000
15	78,000	110,000	155,000
18	127,000	180,000	255,000
21	192,000	271,000	384,000
24	276,000	390,000	550,000

or less than four (4) inches per hour, the roof area specified may be proportionately decreased or increased.

117.86. Food Storage and Processing.—In any establishment engaged in the storage, preparation, selling, serving, processing or otherwise handling of food, the waste piping from all refrigerators, ice boxes, service sinks cooling or refrigerator coils, dipper washers, glass washers, steam tables, egg boilers, coffee urns or similar equipment shall discharge into a sink or other approved indirect-connected fixture complying with the provisions of section 117.3.

117.87. Creamery and Milk House Wastes.—Waste pipes from milk vats, sterilizers, sinks or other receptacles used in creameries and milk houses, shall be of the same size and material as required for waste lines from sinks, and such wastes shall discharge into an approved separator or interceptor.

117.88. Slaughter House and Stable Wastes.—All organic wastes from tanks, processing equipment and from floors of structures occupied as abattoirs, slaughter houses and for similar uses shall be drained to an approved type of interceptor capable of removing all objectionable substances before the effluent therefrom is discharged to the sewer system. Grease interceptors shall be used where slaughter house products are processed for food and other merchandise. All liquid wastes from barns, stables and stable yards and manure pits shall be intercepted before entering the sewer by an approved trapped catch-basin. and provided with a roof vent not less than four (4) inches in diameter.

117.89. Chemical Piping and Wastes.—Chemical-waste pipes, stacks and vents and their connecting joints shall be constructed of approved corrosion-resistive materials which are unaffected by the discharge of such wastes. No corrosive liquids, spent acids, or other harmful chemicals likely to destroy or injure drain, sewer, soil or waste pipes, or which might create noxious or toxic fumes shall be discharged into the plumbing system without being diluted or neutralized by passing through an approved neutralizing device. The discharge from open gutters of industrial plants shall pass through one or more fixed metal strainers or screens of approved

materials to an interceptor complying with section 117.3 before emptying into the sanitary plumbing system.

117.9. Gas-Piping Systems.

117.91. Location of Service Shut-Offs.—A service shut-off cock or valve shall be installed in an accessible location and manner. Such shut-off shall be designed for ease of operation and to preclude the core being blown out of the cock or valve by the gas pressure. The shut-off shall be installed upstream of the meter or regulator, if any. On services two and one-half ($2\frac{1}{2}$) inches or larger in diameter or for large buildings, places of assembly, hospitals, institutions, schools and similar buildings regardless of size the shut-off shall be located outside and maintained accessible by approved stand pipe and cover. The shut-off, its construction and location shall comply with the requirements of accepted engineering practice standards for gas transmission and distribution piping listed in appendix B.

117.92. Main Building Shut-Off.—Each gas service connection which is brought into a structure shall be fitted with a straight-way stopcock or shut-off valve, placed in an accessible position immediately inside of the wall through which such connection enters.

117.93. Meters.—Meters shall be located as near as practicable to the point of entrance of the service and preferably in the cellar or basement of the building or structure. The location shall be accessible, clean, dry, properly ventilated and free from steam or chemical fumes; and the meter shall be protected against extreme cold or heat.

117.94. Manual Control and Pilot Gas Valves.—Every supply line to a gas burner shall be provided with an approved hand operated lever-type shut-off valve installed ahead of all automatic controls at a height of approximately five (5) feet above the floor. The supply line for pilot lights shall be equipped with an independent control ahead of the main shut-off.

117.95. Piping and Fittings.—Gas piping for heating and hot water furnaces shall consist of an independent line direct from the meter of wrought iron or steel with malleable iron fittings or of copper water tube. No cast iron pipe or fittings or aluminum tubing shall be used for the main gas conduit. The piping shall be run straight without sags or traps, shall be pitched as to drain back to the riser, and from the riser to the meter or inlet; and shall be rigidly supported at intervals of not more than six (6) feet by noncombustible straps, hooks, bands or hangers. The use of lead pipe, rubber hose, or other flexible pipe, tubing or fitting shall be prohibited; except that approved flexible metallic tubing connectors shall be permitted for gas appliances which burn not more than ninety (90) cubic feet of gas per hour.

117.96. Protection from Freezing.—All gas piping shall be protected from freezing temperatures. When necessary to conceal piping in brick, stone, concrete or other masonry walls, suitable accessible recesses shall be provided and no gas piping shall be incorporated in the masonry construction.

117.97. Inspections and Tests.—Inspections shall be made of all rough piping installation authorized by the approved plans and permit before it has been covered or concealed and before any fixture or appliance has been attached thereto. After the complete installation of gas piping and before any fixtures or appliances have been attached, the system shall be subjected to an air pressure test. The tests shall be made in the presence

of the building official and all test apparatus shall be furnished and the costs shall be borne by the permit holder. All piping shall be tested to withstand an air pressure fifty (50) per cent in excess of normal operating pressure of the system. In welded piping systems, the test pressure shall be not less than fifty (50) pounds per square inch applied for not less than ten (10) minutes without any loss in pressure. No piping or connections for a meter, gas fixture, gas heater or range shall be covered up until a certificate of approval has been issued by the building official.

117.98. Liquefied Petroleum Gas Piping.—Piping for liquefied petroleum gas shall be designed and installed of approved materials suitable for use on the system. Control valves shall be provided in every installation as herein specified; a main shut-off valve outside of the building on the supply side of the main connection; an auxiliary shut-off on the supply side of every appliance connection; and a relief valve with terminal discharge directly to the outer air at a point not less than five (5) feet distant from any window or other opening in the building or in adjoining structures.

117.99. Bottled Gas.—Cylinders or containers of bottled gas for domestic or commercial use shall be installed above ground outside of the building protected from mechanical injury, with approved valves, flexible connections, piping and safety devices; except that the building official may approve the installation of such containers when required for industrial purposes inside buildings or when used in construction, repair or alteration operations. Bottled gas containers shall not exceed twelve hundred (1200) gallons equivalent water capacity; and shall be tested and approved by an accredited testing authority and shall be labeled and identified in accordance with the Interstate Commerce Commission regulations.

SECTION 118.0. AIR CONDITIONING, REFRIGERATION AND MECHANICAL VENTILATION

118.1 Approved Systems.—All air conditioning, refrigerating, ventilating, cooling and air exhaust systems hereafter installed, and all alterations or additions to existing systems in buildings, and structures heretofore or hereafter erected shall be of an approved type complying with the provisions of this code and the Basic Code. Nothing herein contained shall be deemed to nullify the federal, state or municipal rules and regulations governing the storage and use of flammable and explosive gases and chemicals, or the requirements of the Interstate Commerce Commission or other federal statutes governing the transportation and use of hazardous gases, explosives and other flammable substances. The provisions of the American Standard Safety Code for Mechanical Refrigeration listed in appendix B shall be deemed to meet the provisions of this code; except as otherwise specifically provided herein.

118.11. Residential Buildings.—One- and two-family and multi-family dwellings (use groups L-2 and L-3) shall not be required to secure permits unless the refrigerating system contains more than ten (10) pounds of refrigerant or is actuated by motors or engines of one and one-half ($1\frac{1}{2}$) horsepower or larger.

118.12. Unit Refrigerating Systems.—All self-contained units designed either for use in the conditioned space or for use in a central system with air duct distribution which require no external construction other than water or electrical connections shall be of an approved type and the gas, plumbing and electric connections shall conform to the requirements of sections 117 and 121. In buildings of residential, business, commercial and industrial groups no permit shall be required for the installation of self-contained unit refrigerating systems with capacities of not more than six (6) pounds of group 1 refrigerants.

118.13. Site Assembled Systems.—All built-up and site assembled installations used either as direct or indirect systems with group 2 or group 3 refrigerants shall have all parts containing refrigerants enclosed in vapor tight and fire-resistive machinery rooms or located in accessory structures not connected to the main buildings in accordance with section 119.41.

118.14. Certificate of Approval.—A permit shall be required for all new installations and for alterations or additions to existing installations or where required for the remedying of existing defective installations, except as herein provided. No refrigerant other than provided for in the American Standard Safety Code and specified in the certificate of approval shall be employed in the system.

118.15. Tests.—Every part of a refrigerating or air conditioning system containing the refrigerant shall be tested for tightness by the manufacturer at not less than the minimum specified test pressures; and no air conditioning, refrigerating or ventilating system requiring a permit shall be operated or permitted to be operated until it has been approved by the building official. All tests shall be conducted in accordance with the American Standard Safety Code and the approved rules adopted thereunder.

118.16. Existing Approvals.—Existing air conditioning, refrigerating and ventilating equipment heretofore legally installed may be continued in use, providing the public safety is not endangered thereby and the system is maintained in a safe operating condition as required by the building official. If the continued use of existing equipment is unsafe, he shall order such use to cease until all defects are remedied.

118.17. Power of Condemnation.—Whenever a system or any part thereof is found to be unsafe to life or property, it shall be forthwith condemned and no such system shall thereafter be restored to use until it has been made safe and approved for use.

118.18. Inspections and Certificates.—All systems requiring permits shall, upon their completion, be inspected by the building official. If found safe and in conformity to the provisions of this code, he shall issue a certificate which shall be kept posted in a conspicuous location. Refrigerating systems in buildings of the public assembly or institutional use groups shall be inspected periodically. Upon inspection or reinspection of an air conditioning, refrigerating, or ventilating system, any defects or deficiencies in any part of the system which require repair to insure safe operation shall be immediately rectified before the system is returned to use.

118.19. Housekeeping.—All air conditioning and refrigerating systems shall be operated and maintained in a clean and orderly manner, free from accumulations of dust, oily waste or other debris and all piping and machinery shall be kept readily accessible at all times for inspection and

repair. Plenum chambers, air ducts, cooling and heating coils shall be kept clean, and unit filters shall be cleaned or renewed to insure unimpeded air flow and fire safety.

118.2. Accidents.—The owner, lessee or person in charge of air conditioning or refrigerating systems shall immediately notify the building official of each and every accident to a person involving medical attention or damage to apparatus or property on or about or in connection with the installation; and he shall afford the building and other authorized administrative officials every facility for investigation. The removal of any part of the damaged construction or operating mechanism from the premises is forbidden until permission has been granted by the building official.

118.3. Classification of Refrigerants.—Refrigerants shall be classified in accordance with the Standard Safety Code.

118.4. Location and Installation of Systems.—No air conditioning or refrigerating systems shall be installed in public hallways, lobbies, stairways, or other exitways of any building, or in elevator or dumbwaiter shafts, except that a direct sealed unit system containing not more than six (6) pounds of group 1 refrigerant may be installed in exit corridors provided free exit passage is not obstructed thereby and such installation is approved by the building official. Refrigerant piping crossing passageways or corridors in any building shall be erected with not less than seven (7) feet clearance above the floor; and no such piping shall be located in any duct work of the system.

118.41. Machine Room Enclosure.—Machine rooms for all air conditioning and refrigerating systems containing fifty (50) pounds or more of group 2 and group 3 refrigerants shall be enclosed with vapor-tight construction of not less than two (2) hours fire resistance with one and one-half (1½) hour self-closing fire doors or the approved labeled equivalent complying with section 119.8. No openings shall be provided that will permit the escape of the refrigerant to other parts of the building. The exit door shall open directly to the outer air, or the machinery room shall be provided with a vestibule with self-closing fire door at both entrance and exit.

118.42. Emergency Ventilation.—The machinery room shall be ventilated to the outer air, either by windows or approved mechanical exhaust systems as specified in the standard. No flame producing device or hot surfaces at a temperature above eight hundred (800) degrees F. shall be permitted in the machine room and all electrical equipment shall conform to the requirements of the National Electrical Code for electric installations in hazardous locations.

118.43. Quantity of Refrigerant.—Not more than three hundred (300) pounds of refrigerant shall be stored in approved containers in the machinery room. Quantities in excess of three hundred (300) pounds shall be stored in a separately enclosed accessory room or building enclosed in three (3) hour fire-resistive construction.

118.44. Disposal of Waste Refrigerant.—The containers into which refrigerants are discharged or withdrawn from a refrigeration system shall comply with the Interstate Commerce Commission regulations and speci-

cations for shipping containers. When refrigerant is added to a system, except in unit systems containing not more than six (6) pounds of refrigerant, it shall be charged on the low pressure side; and no containers shall be left connected to a system except while charging or withdrawing refrigerant. Refrigerants withdrawn from a system shall be transferred in the approved containers and shall not be discharged into any sanitary sewer or plumbing system, but shall be disposed of in accordance with the provisions of section 117.3.

118.5. Equipment and Operation of Systems.

118.51. Blower Shut-Off.—All ventilating and air conditioning systems using fans or blowers shall have an approved manually operated blower shut-off switch in an accessible location for quickly closing down the fan in case of fire. In recirculation systems servicing more than one (1) story of a building, or more than one (1) fire area of a single story, the fan shall be arranged to shut down automatically if the air temperature reaches one hundred and twenty-five (125) degrees F. in any part of the system.

118.52. Smoke Detector.—When the life safety of any use and occupancy is exceptionally hazardous or when required for automatic operation of exhaust systems, all mechanical ventilation and air conditioning systems shall be provided with an approved smoke detector.

118.53. Emergency Valve and Tank.—All refrigerating systems employing more than one hundred (100) pounds of group 2 or group 3 refrigerants shall be provided with an emergency tank equipped with a quick-acting, readily accessible and identified gate valve to purge the system of all refrigerant in the event of fire, complying with section 403 of the Basic Building Code.

118.54. Steam and Hot Water Heating Equipment.—The installation of all steam and hot water apparatus in air conditioning systems shall comply with the requirements of section 113 and 114 for piping, flues and flue connections. Direct heating units when used in air conditioning systems shall be equipped with an approved temperature limit-control device. The steam pressure in heating coils of all air conditioning systems shall not exceed fifteen (15) pounds per square inch gage pressure.

118.55. Piping and Valves.—All piping, tubing and valves used in construction and installation of a refrigerating or air conditioning system shall conform to accepted engineering practice governing pressure piping and shall be suitable for the refrigerant used therein, and no construction materials shall be used that might deteriorate under the chemical action of either the refrigerant or lubricating oil, or combined action of both. Brass and copper pipe and hard copper tubing shall comply with sections 117.76, 117.77, and 117.78. Vertical refrigerating piping extending through two (2) or more stories shall be enclosed in two (2) hour fire-resistive shaft enclosures with vent relief above the roof; unless erected on the exterior of the building in other than interior courts or air shafts. All insulated and uninsulated refrigerant piping other than piping located on the exterior of the building or structure, or when located in a flue vented to the outer air, shall be installed so as to be accessible for visual inspection and maintenance, except when required to be protected against mechanical injury, or when located in the enclosed cabinet of an approved refrigerating unit. In systems operating on group 1 refrigerants, the piping may be

carried through floors provided it is enclosed in fire-resistive ducts or shafts vented to the outside air.

118.56. Hangers and Supports.—All equipment piping, tubing and other accessories containing refrigerant shall be fully supported in an approved manner by hangers and supports of metal or other approved noncombustible material and such supports or hangers shall be used for no other purpose.

118.57. Soldered Joints on Copper Tubing.—Soldered joints on copper tubing used in all refrigerating systems in buildings for institutional and assembly uses (use groups F and H) and in refrigerating systems containing more than twenty (20) pounds of refrigerant gas in buildings of other use groups shall be fabricated using solders or alloys with melting points of not less than one thousand (1000) degrees F.

118.58. Discharge Lines.—Discharge lines from condensers and other equipment shall not be directly connected to the waste or sewer system but shall discharge over and above the rim of a tripped and vented plumbing fixture or other interceptor or into a separate storm water sewer as provided in section 117.

118.59. Water Connections.—Discharge water lines from condensers shall be connected to prevent siphoning into potable water supply lines and no water used for removing heat from a refrigerating system shall be discharged into any water supply directly or indirectly intended for domestic purposes or human consumption.

118.6. Air Inlet and Outlet Openings.

118.61. Exterior Openings.—Fresh air intakes with less than thirty (30) feet exposure distance to openings in adjoining walls or buildings shall be protected with approved automatic fire shutters, curtains or other approved opening protectives complying with section 118.9. Exterior fresh air intake and exhaust openings when located on a street or alley lot line shall be installed not less than twelve (12) feet above grade; and all intakes shall be protected by approved corrosion-resistive screens. Exterior exhaust openings shall be provided with approved protecting guards, covers or other approved means of preventing the creation of a nuisance; and shall not circulate air downward in such manner as to strike pedestrians. The discharge outlet shall be located not less than twelve (12) feet above grade and not less than twenty (20) feet horizontally from a fire escape, exterior stairway or other required exitway.

118.62. Interior Openings.—Interior air inlet and outlet openings within buildings and structures shall be located not less than three (3) inches above floors, except that approved mushroom type inlets may be located under the seats in places of public assembly equipped with fixed seats.

118.7. Duct Construction and Supports.—All ducts shall be constructed of approved, noncombustible, corrosion-resistive materials in accordance with the requirements of section 113.6. Ducts may be independently erected or may be incorporated in the walls or other parts of the structure, provided that the portion of the structure forming the duct enclosure meets the minimum requirements for strength and fire resistance of table 5. Ducts shall be made reasonably air-tight throughout, without openings other than those required for the proper operation and maintenance of the air condi-

tioning or ventilating system. Ducts and all parts of the duct system shall be substantially supported and securely fastened to the structural members of the building with supports of approved, durable, noncombustible materials.

118.71. Plenum Chambers.—Plenum chambers shall conform to all the minimum requirements for duct systems, and when such chambers are enclosed in walls or partitions, the enclosure shall be constructed in accordance with the requirements of section 112 for enclosure walls, but in no case shall the fire-resistance rating be less than two (2) hours.

118.72. Return Ducts.—Return ducts, other than vertical, shall be so constructed that the interior is accessible to facilitate the removal of possible accumulations of dust and other combustible and flammable matters. Where corridors or hallways are used as return ducts, an approved smoke detector or other device shall be provided to stop the exhaust fan automatically and instantaneously in the presence of smoke. The louvres provided for the transmission of air to and from air-conditioned spaces to such corridors shall be arranged to close automatically after stopping of the fans and shall be equipped with auxiliary manually operated closing devices which can be readily closed in emergency.

118.73. Supply Ducts.—Supply ducts, other than vertical, shall conform to the requirements for return ducts, except when the entire air supply passes through either a water spray or approved filter as specified in section 118.8.

118.74. Location of Ducts.—All ducts shall be installed so that they will not vitiate the strength of any structural member and so as not to be subject to mechanical damage. Metal ducts shall be installed not nearer than two (2) inches to any combustible construction unless protected by approved insulating material complying with section 118.75.

118.75. Linings and Coverings.—Only approved noncombustible materials shall be used for duct lining; nor shall combustible coverings be used on the outside of ducts carrying air at temperatures greater than one hundred and seventy-five (175) degrees F. All coverings shall be adequate to prevent a temperature of more than two hundred and fifty (250) degrees F. on the exterior exposed surface.

118.76. Firestopping.—The firestopping of floors, partitions and walls shall not be destroyed where ducts pass through floors, ceilings, walls, or partitions, nor shall the effectiveness of the fire protection be impaired around structural members as required in section 103.1 and table 5 of the Basic Building Code.

118.77. Flammable Residues.—Ducts for exhaust ventilation and air conditioning systems which discharge or contain flammable vapors, dust or other solid residues shall extend to the exterior of the structure in the most direct manner possible and shall not pierce floors except when enclosed with construction of the required fire resistance as defined by the fire grading in table 29; nor shall such ducts transporting flammable matters extend through fire walls, nor shall they be incorporated in the structural elements of the building. Such discharges shall be piped directly to the outside of the building; and the discharge outlet shall be located to comply with section 118.6.

118.8 Air Filters.—Air filters shall be of approved types, constructed of flame-resistive materials. The flash point of liquid adhesive coating used on air filters shall be not less than three hundred and fifty (350) degrees F. The use of oil filters that may be subject to flowing or dripping oil shall be prohibited.

118.9. Fire Dampers and Opening Protectives.

118.91. Fire Division Walls.—An approved fire door or an approved automatic fire shutter complying with the provisions of section 119.8 shall be provided at each side of a fire division wall which is pierced by a duct of an air conditioning or ventilating system. Such opening protective shall be installed so as to be readily accessible for inspection and repair.

118.92. Fire Dampers.—When fire doors are not practical, approved automatic fire dampers shall be constructed of noncombustible materials and installed in the prescribed locations complying with the standard Safety Code for Refrigeration.

SECTION 119.0. FIRE SAFETY AND FIRE PROTECTION

119.1. Fire Walls.—All fire walls for the purpose of subdividing a building into limited fire areas, complying with table 6 of the Basic Building Code, or which separate two (2) or more buildings to restrict the spread of fire shall be ground-supported, or shall be so constructed as to be self-supporting in the event of collapse of adjoining construction on one side. In fireproof construction, the fire walls may be supported on columns and girders protected to afford the same fire resistance as the wall; and when offset, the floor construction shall be of the same fire resistance required for the fire wall. The fire-resistance ratings of fire walls shall conform to the requirements of table 5, but in no case shall such fire resistance be less than two (2) hours, nor in any case less than the fire grading of the use group specified in table 30.

Insulating batts, blankets, fills or similar types of materials, including vapor barriers and breather papers or other coverings which are a part of the insulation, incorporated in construction elements shall be installed and used in a manner that will not increase the fire hazard characteristics of the building or any part thereof. Such materials shall comply with the requirements of section 878 of the Basic Code.

Where the behavior of materials under exposure to fire is specified in the Abridged Code the characteristics of materials shall be determined in accordance with section 903.7 of the Basic Code.

TABLE 30.—ABC FIRE HAZARD CLASSIFICATION

Use group	Fire grading in hours
1- and 2-family dwellings	¾
Multi-family dwellings	1½
Hotels, boarding and lodging houses and dormitories	2
Institutional	2
Assembly	3
Business	3
High hazard	4 or more

For comprehensive table, see table 16, Basic Building Code.

119.11. Hollow Fire Walls.—When wood or other combustible structural members frame into hollow masonry fire walls or walls built of hollow masonry units, all spaces shall be filled solidly for the full thickness of the wall and for a distance of not less than four (4) inches above and below and between the structural members with concrete or other noncombustible materials.

119.12. Combustible Insulation.—Fire walls may be faced with cork, fiber board or other combustible insulation materials if cemented directly to the fire wall without intervening air spaces and protected on the exposed surface with an approved noncombustible veneer or shall be treated to be noncombustible.

119.13. Height of Fire Walls.—Except as herein provided, fire walls shall extend not less than two (2) feet eight (8) inches above the roof with flashing on both sides and shall be coped with weather-resisting and noncombustible materials. In buildings of the residential use group, fire walls may be stopped six (6) inches above the top of the roof sheathing, provided the junction of wall and roof framing is thoroughly firestopped and no combustible materials extend through the wall; and when the roof construction has a fire-resistance rating not less than that of the fire grading for the specific use, the fire wall may stop at the roof level if completely firestopped.

119.14. Frame Construction.—All fire walls in frame construction shall extend through exterior walls and other intersecting walls of less fire resistance than the fire wall to the outside of all combustible wall and roof sheathing.

119.2. Fire Divisions.—Fire divisions in buildings of mixed occupancies to establish complete separation both horizontally and vertically between such adjoining uses in any one building or structure shall be constructed to develop the fire-resistance ratings corresponding to the fire grading on both sides.

119.21. Business Separation.—In all buildings of the residential use group in which retail business is conducted in the first story, subject to the restrictions of the zoning laws, the ceilings and enclosing partitions between the business and dwelling portions and the exitways from the dwelling areas shall be protected to afford not less than three-quarter ($\frac{3}{4}$) hour fire resistance.

119.22. Party Walls.—Party walls erected between two (2) buildings with flat roofs shall extend not less than six (6) inches above the roof and shall be flashed and coped as for fire walls. In buildings and structures of the residential use group, the roofs of which slope at an angle of thirty (30) degrees or more to the horizontal, party walls may stop at the level of the top of the roof boards provided no combustible material passes through the wall and the junction of roofs and wall is completely firestopped as required in section 119.9. The fire-resistance rating of party walls not required to restrict the allowable areas specified in table 6 of the Basic Building Code for each use group and type of construction shall conform to the fire grading established for the use of greatest fire hazard separated thereby as prescribed in table 30. Party walls in frame construction may be constructed of wood studs protected on both sides and filled with noncombustible materials to afford the equivalent fire-resistance rat-

ing of the use group of highest hazard separated thereby.

119.3. Separation and Bearing of Structural Members.

119.31. Masonry Wall Construction.—All wood and other combustible floor joists and roof rafters framing into masonry wall shall be cut to a bevel of three (3) inches in the depth and shall project not more than four (4) inches into the wall. The distance between the imbedded ends of adjacent beams or joists entering the wall from opposite sides shall be not less than four (4) inches.

119.32. Heavy Timber Construction.—Wood girders shall have not less than eight (8) inches of masonry between their ends and the outside face of the wall and not less than eight (8) inches of masonry between adjacent girders entering the wall from opposite sides. Such girders shall be supported on wall plates, hangers of steel or other noncombustible supports or boxes which are designed to be self-releasing in the event of fire.

119.4. Hazardous Spaces.—In all buildings other than one- and two-family dwellings, boiler rooms, incinerator rooms, storage rooms for flammable contents or ash storage shall be enclosed with not less than two (2) hour fire-resistive construction.

119.41. Basement Ceilings.—In all buildings other than one- and two-family dwellings of frame or unprotected ordinary construction, with habitable or occupiable rooms or basements below grade, the first floor construction shall be protected with ceilings of not less than three-quarter ($\frac{3}{4}$) hour fire-resistance rating and as herein provided:

119.42. Attached Private Garages.—Attached private garages shall be constructed as specified in section 107.7.

119.43. Basement Recreation Rooms.—Basements used as recreation and playrooms in multi-family dwellings shall be protected to comply with section 108.28.

119.44. Deleted.—No requirements.

119.45. Places of Assembly.—No dance hall, skating rink or similar places of public assembly for amusement, entertainment or service of food or refreshment shall be located in stories or rooms below grade unless the first floor is of fire-resistive construction with a fire-resistance rating of not less than one and one-half ($1\frac{1}{2}$) hours and not less than two (2) approved remote exitways leading to the street are provided enclosed in not less than three-quarter ($\frac{3}{4}$) hour fire-resistive partitions as required in section 108.4.

119.5. Roof Coverings Within the Fire Limits.—Within the fire limits, all roof coverings shall be asbestos, brick, concrete, metal, slate, tile, prepared asphalt or laminated felt roofing finished with asphalt, slag, gravel or similar noncombustible moisture-resistant materials or approved combinations of such materials, classified as class 1, class 2 or class 3 roofings under the Basic Building Code.

119.51. Combustible Decking.—Unless attached directly to noncombustible framework, all roof coverings shall be applied to a closely fitted deck; except as herein provided for wood shingles.

119.52. Fire and Party Wall Restrictions.—No wood planking, sheathing or other combustible decking when used in roof construction shall extend through or over a party wall or fire wall or across a lot line.

119.53. Roof Insulation.—The use of cork, fiber board and other roof insulation of similar combustible characteristics complying with section 904.4 of the Basic Building Code shall be permitted, provided it is attached directly to the roof decking or sheathing and is covered with an approved roof covering.

119.6. Roof Coverings Outside the Fire Limits.—Roof coverings that are classified as class 4 under the Basic Building Code, including wood shingles, shall be permitted for use on one- and two-family dwellings of frame construction not exceeding two (2) stories and attic or thirty-five (35) feet in height and four thousand (4000) square feet in area when the distance of the building from property lines, or from the opposite sides of public spaces or from any other building is not less than twelve (12) feet; and on private garages and other similar accessory buildings located on the same lot with a dwelling; and on one (1) story storage buildings of low or moderate fire hazard not more than six thousand (6000) square feet in area when separated not less than twenty (20) feet from lot lines or from any other building or structure.

119.7. Wood Shingles.—Approved edge-grain wood shingles may be used as roof covering as provided in section 119.6 when nailed firmly with aluminum, copper, zinc, zinc coated or other approved corrosion-resistive nails, in accordance with manufacturers' standards, but with not less than two (2) nails to each shingle. The length of shingle exposed to the weather shall be not more than herein specified:

16 inch shingle.....	5 inch exposure
18 inch shingle.....	5½ inch exposure
24 inch shingle.....	7½ inch exposure

119.8. Fire-Resistive Opening Protectives.—Opening protective assemblies including the frames, hardware, installation and operation which comply with the standards and accepted practice including shop inspection of the Underwriters' Laboratories or other accredited testing authorities shall be deemed to meet the requirements of this code for their recommended and approved locations and uses.

119.81. Fire Doors.—Where door openings are required to be protected with approved fire doors, such door assemblies including the hardware shall be tested and approved for the specified time-temperature performance under the standard fire test procedure with not less than the fire-resistance ratings prescribed in table 31; or shall be the approved labeled equivalent recommended for the specified location and use.

TABLE 31.—TIME-TEMPERATURE PERFORMANCE OF FIRE DOORS

Use	Fire-resistance rating in hours
Fire walls and fire divisions of 3-hr. or more construction.....	3
Fire walls and fire partition of 2-hr. construction....	1½
Elevator enclosures and fire towers.....	1½
Stairway and exitway enclosures.....	¾
Fire-resistive partitions of 1-hr. or less rating.....	¾

Note: In residential and business buildings not more than three (3) stories or forty (40) feet in height with an occupancy load of not more

than forty (40) below and seventy-five (75) above grade, solid core doors of the flush type, one and three-quarter ($1\frac{3}{4}$) inches thick may be accepted in exitways and in openings from hotel rooms to the corridors. Plywood face veneers not more than one twenty-eighth ($1/28$) inch thick shall be permitted on such doors and other opening protectives.

119.82. Fire Windows.—Where approved fire windows or fire shutters are required in exterior walls, the complete assembly including frames, glazing and hardware shall develop a three-quarter ($\frac{3}{4}$) hour fire-resistance rating or shall be the approved labeled equivalent. Fire shutters of the rolling type shall be of approved counter-balanced construction that can be readily opened from the outside.

119.83. Fire Dampers.—Automatic or self-closing fire dampers of not less than No. 16 U.S. gage shall be provided in ducts, chutes, belts and conveyors where they pass through fire division partitions on both sides of the wall and at floor openings as provided in section 118.9. They shall be so designed as to close effectively the opening with a complete firestop.

119.9. Firestopping.—Firestopping shall be designed and installed to close all concealed draft openings and to form effective fire barriers against the spread of fire in all sub-divisions of any one story and between all stories of the building; and all open spaces in the structural frame, including among others the locations herein specified; and all other openings that would permit the free travel of flame shall be effectively firestopped. Such firestopping shall be constructed of formed steel of not less than No. 20 U.S. gage or other approved noncombustible materials effectively secured in place; except that in open spaces of wood-frame construction, firestops of two (2) thicknesses of one (1) inch lumber with broken lap joints or of two (2) inch lumber installed with tight joints shall be permitted.

119.91. Wood Stud Walls.—All wood stud walls and partitions shall be firestopped for the full depth of floor and roof framing at each floor level and between the ceiling of the top story and the roof space. When such spaces are required to be ventilated as prescribed in sections 111.8 and 115.3, the details of firestopping shall be approved by the building official.

119.92. Furred Spaces.—All furred spaces of frame walls and studded off spaces of masonry walls shall be firestopped at maximum intervals of eight (8) feet both horizontally and vertically.

119.93. Sliding Doors.—Where sliding doors are pocketed in partitions, such pockets shall be completely firestopped on all sides.

119.94. Stairways.—Firestopping shall be provided between stair stringers at least once in the middle portion of each run and at the top and bottom and between studs of frame construction along and in line with the run of the stairs.

119.95. Pipes and Ducts.—The space around pipes, ducts or power shafting in floor or partition construction which is penetrated by such equipment shall be firestopped by filling with noncombustible materials or by close-fitting metal caps at ceiling and floor line and at both sides of the partition; or such openings shall be otherwise protected to prevent the passage of flame, hot gases and smoke.

119.96. Combustible Trim and Finish.—In all fire-resistive construction and where permitted in exitways all combustible slow-burning fire-retar-

dant wall and ceiling trim, wainscoting, acoustical and insulation treatments and finish on masonry or other fire-resistive wall and ceiling construction shall be applied directly to the noncombustible base or the space behind such trim and finish shall be filled solidly with noncombustible materials or firestopped in areas of not more than ten (10) square feet and no dimension more than eight (8) feet vertically or horizontally; except that combustible trim and finish shall be prohibited in public hallways and exitways of buildings of the institutional use group which are more than two (2) stories in height or having sleeping accommodations for more than twenty-five (25) persons.

119.97. Fireplaces.—The open spaces between backs and sides of chimneys and fireplaces and combustible framing shall be firestopped with noncombustible materials.

119.98. Exterior Cornices.—Exterior cornices of wood construction as provided in section 112.81 shall be fully firestopped or shall be built noncontinuous and completely separated between adjoining buildings.

119.99. Inspection.—No firestopping shall be concealed or covered until it has been inspected and approved by the building official.

SECTION 120.0. ELEVATOR, DUMBWAITER AND CONVEYOR EQUIPMENT

The design, construction, installation, maintenance and operation of all elevators, dumbwaiters, moving stairways and conveyors for moving persons, materials and merchandise hereafter installed, relocated or altered in buildings and structures shall comply with the provisions of the Basic Building Code and the Safety Code for Elevators, Dumbwaiters and Moving Stairways listed in appendix B. Special hoisting and elevating equipment and amusement devices shall be subject to special approval of the building official. Hoistway enclosures shall comply with section 115.9.

120.1. Tests and Inspections.—Acceptance tests and inspections shall be required of all new installations and major alterations as prescribed in section 1603 of the Basic Building Code.

120.2. Moving Stairways.—All moving stairways shall be enclosed or the openings shall be protected with an approved exhaust system with water curtain thermostatically controlled to operate simultaneously with the detection of fire or with an approved power operated fire shutter having a one and one-half (1½) hour fire-resistance rating as required in sections 522, 622 and 1622 of the Basic Building Code.

120.3. Existing Elevators.—All existing passenger and freight elevator installations shall comply with the provisions of section 1606 of the Basic Building Code.

SECTION 121.0. ELECTRIC EQUIPMENT AND WIRING

All new electric wiring for light, heat and power service equipment, for radio and television receiving systems, and all alterations or extensions to existing wiring systems in buildings and structures shall comply with

the National Electrical Code listed in appendix B.

121.1. Exceptions.—The provisions of this code shall not be applied to electrical power supply companies or communication agencies in respect to the generation, transmission, or distribution of electric power and light, to public communication transmission systems, to operation of signal systems used exclusively by public service agencies, to installation or equipment used by railway utilities and public carriers or to radio transmission systems, other than the equipment and wiring for power supply and the installation of radio towers and antennae whether erected on buildings or on the ground.

121.2. Electric Installation Standards.—Conformity of installations of electrical equipment to the National Electrical Code and National Electrical Safety Code shall be prima facie evidence that such installations and equipment are reasonably safe for use in the service intended and in compliance with the provisions of this code.

121.3. Electric Equipment Standards.—The materials, fittings, appliances, devices and other equipment listed in publications of inspected electrical equipment of the Underwriters' Laboratories, Inc., and other accredited authoritative agencies and testing organizations and installed in accordance with the recommendations of the approved report shall be accepted as meeting the requirements of this code.

121.4. Certificates of Approval.—No electric wiring system shall be used or current supplied for light, heat or power in a building or structure until the required certificate of inspection and approval has been issued by the building official except for temporary current for a part installation or for testing purposes.

SECTION 122.0. FIRE PREVENTION AND FIRE EXTINGUISHING EQUIPMENT

The installation of fire alarms, fire communication systems, fire extinguishing equipment and the organization of private fire brigades and fire drills in all buildings and structures shall comply with the requirements of this section and the Basic Building Code.

122.1. Approved Devices.—The building official shall accept the label or listing in the publication of tests and approvals of inspected fire protection equipment and materials of accredited, authoritative agencies cited in appendix A when installed in accordance with the limitations of the approvals.

122.2. Standpipe Fire Lines.—All buildings hereafter erected or altered which are designed for use other than one- and two-family dwellings, or which are not already equipped with two and one-half ($2\frac{1}{2}$) inch or larger standpipes, shall be provided with an approved standpipe complying with the provisions of the Basic Building Code, as herein specified:

122.21. Buildings Over Two Stories.—When more than two (2) stories or more than thirty (30) feet in height and more than ten thousand (10,000) square feet in area; except that when not of a high hazard use and the building is equipped with an approved sprinkler system not otherwise required, the requirement for a standpipe shall be waived.

122.22. Hose Connections.—Standpipes shall be equipped in every story with two and one-half ($2\frac{1}{2}$) inch hose connections conforming to the municipal fire department standard and hose of sufficient length to reach all parts of the floor area, within thirty (30) feet, but not more than one hundred and twenty-five (125) feet in length. In hotels and institutional buildings and in business buildings designed for office use, one and one-half ($1\frac{1}{2}$) inch hose may be permitted when installed with a reducer coupling on the two and one-half ($2\frac{1}{2}$) inch outlets.

122.23. Exceptions.—Buildings of fire-resistive construction equipped with an approved automatic sprinkler system not otherwise required by the provisions of this code shall be exempt from the standpipe requirement.

122.24. First Aid Standpipe.—First aid standpipe firelines for use of the occupants of the building or of the trained fire brigade shall be provided in buildings of the use groups herein specified. The system shall consist of not less than two and one-half ($2\frac{1}{2}$) inch risers with one and one-half ($1\frac{1}{2}$) inch hose so that every part of the floor area requiring protection can be reached within twenty (20) feet with not more than seventy-five (75) feet of hose.

Business buildings in which flammable materials, products or other hazardous conditions are present and which are more than two (2) stories or thirty (30) feet in height and more than three thousand (3000) square feet in undivided floor area, except when such buildings are equipped with an approved automatic sprinkler system not otherwise required;

Institutional buildings, including hospitals, asylums, places of detention and hotels and dormitories which are more than two (2) stories in height with sleeping accommodations for more than twenty-five (25) occupants;

Assembly buildings, including theaters, night clubs, assembly halls, lecture halls and recreation centers with an occupancy load of more than three hundred persons.

122.3. Automatic Sprinklers.—Buildings of the use groups herein specified shall be equipped with an automatic sprinkler system complying with the provisions of the Basic Building Code and the applicable standards listed in appendix B;

Public garages with a storage capacity of twenty (20) or more automobiles which are located in buildings in which the upper stories are designed for other uses;

Passenger terminals and bus garages which are more than two (2) stories or thirty (30) feet in height;

Mercantile buildings which are more than twenty thousand (20,000) square feet in area on any story above or below grade when of fireproof or one and one-half ($1\frac{1}{2}$) hour protected noncombustible construction, or more than ten thousand (10,000) square feet in area when of three-quarter ($\frac{3}{4}$) hour protected noncombustible or mill-type construction, or more than seven thousand five hundred (7500) square feet in area when of unprotected noncombustible or ordinary construction, or more than six thousand (6000) square feet in area of frame construction;

Unpierced enclosure buildings which are designed for industrial occupancy except refrigerating plants and buildings or parts thereof used for the cold storage of meats and other food products; and

Unlimited area buildings to comply with section 107.5; except that build-

ings used for the storage or manufacture of noncombustible products shall be exempt from the requirement of automatic sprinklers.

122.31. Partial Protection.—All parts and areas of residential, institutional and assembly buildings, other than one- and two-family and multi-family dwellings, used for storage or workshop purposes which involve combustible or flammable materials shall be equipped with an approved automatic sprinkler system of one source supply. When approved by the building official, such partial systems used to protect isolated hazardous locations and unenclosed stairways in existing buildings, may be serviced from the building water supplies, if adequate to service such sprinkler heads for not less than twenty (20) minutes at a pressure of fifteen (15) pounds per square inch at the topmost head.

122.32. Approved Systems.—Only approved sprinkler heads, fittings, connections, valves, piping and water supplies shall be used complying with the provisions of the Basic Building Code. Devices and materials listed in publications of inspected fire protection equipment of accredited insurance and testing agencies listed in appendix A and appendix B shall be deemed to comply with the requirements of this code.

122.4. Standby Equipment.—Approved hand-operated auxiliary fire extinguishing equipment including water barrels, buckets, hand fire extinguishers, chemical engines, axes, hooks, ladders and similar appliances shall be installed in the corridors and other locations involving fire hazard of all buildings of the use groups herein specified. Such auxiliary emergency equipment shall be installed in readily accessible locations for the use of the occupants or the trained fire brigades. When enclosed in cabinets, they shall be equipped with readily-opened, keyless doors, or readily-broken glass access panels.

Theaters and assembly halls shall be provided with not less than two (2) approved extinguishers in the stage area where movable scenery is employed; not less than one (1) such extinguisher on permanent stages or platforms without scenery or stage equipment; not less than one (1) such extinguisher in each tier of dressing rooms; and one immediately outside of the entrance to every permanent motion picture booth.

Schools and lecture halls shall be provided with not less than one (1) approved extinguisher for each three thousand (3000) square feet on each occupied floor and not less than one (1) in each laboratory, shop or other vocational room.

Hotels and dormitories more than two (2) stories in height, not equipped with standpipes or automatic sprinklers, shall be provided with at least one (1) fire extinguisher on each floor at the stairway landing and in the public hallway.

Construction operations shall be protected during construction with at least one (1) fire extinguisher in each storage shed and on each run of combustible scaffolding forty (40) feet or more in height.

122.5. Central Station Alarm Systems.—Fire alarm transmission systems shall be provided with connection to a central local station, to an approved proprietary supervising office, or with a direct fire department connection in all institutional and hotel buildings more than two (2) stories or twenty-five (25) feet in height or in which sleeping accommodations are provided for more than twenty-five (25) persons, in all public assembly buildings with an occupancy load of more than three hundred (300) persons, and

in all nursery buildings accommodating more than thirty (30) children above the first floor.

122.6. Interior Fire Alarms and Fire Brigades.—Approved interior fire alarm signal systems with or without the conduct of fire drills shall be provided in all buildings of the following use groups;

Business buildings more than two (2) stories in height, not equipped with an approved automatic sprinkler system in which more than twenty-five (25) persons are engaged in manufacturing above the first floor and all industrial buildings with unpierced enclosure walls more than one (1) story in height;

Mercantile buildings: all department stores more than two (2) stories in height which are not equipped with an approved automatic sprinkler system;

School and nursery buildings: all school and nursery buildings with provision for more than thirty (30) children above the first story;

Hospitals and asylums: all hospitals, asylums, and similar institutional buildings accommodating more than fifteen (15) patients above the first story; and in

Residential buildings: all hotels, lodging houses, dormitories and bath houses having more than fifteen (15) sleeping rooms or accommodating more than fifty (50) persons above the first floor.

122.61. Fire Drills.—Systematic supervised fire drills shall be conducted in factory buildings, schools and all other buildings requiring interior fire alarm signal systems under the provisions of this code, except in buildings of the residential use groups. Such drills shall be conducted simultaneously throughout the building at least once every thirty (30) days. A complete report and written record of the procedure shall be filed with the administrative authority.

122.62. Fire Brigade and Watchman Service.—In hotel, institutional and industrial buildings requiring interior fire alarm signal systems, organized fire brigades or supervised watchman's services shall be provided, trained and instructed in the operation of all auxiliary fire fighting and protective equipment to insure minimum interference with the use of exitways while occupants are discharging from the building and to patrol all floors and areas of the building other than private guests' quarters in hotels at fixed periodic intervals during the day and night.

GENERAL NOTES CONCERNING STANDARDS CITED IN THE ABRIDGED BUILDING CODE

The standards issued by the accredited authoritative agencies listed herein are intended to serve as criteria for accepted safe practice for various materials, products, systems of construction, or specific uses as required or used under the provisions of the code. The text of the code referring to any standard indicates whether conformance with that standard is mandatory or permissive.

In the following appendixes an effort has been made to group the standards according to the principal subjects to which they apply. Some standards cover both accepted engineering practice and material specifications, or other combinations of subject matter, so that it is sometimes necessary for convenience to list them in more than one of the appendixes.

Wherever possible the standards have been listed under the designation of the principal authoring agency. Many of these standards are reissued by one or more agencies, in addition to the authoring agency, under their own designations. While there may be some variation in details in the various versions of the same standard issued by several agencies, these differences are generally of such minor nature that any of the versions is acceptable even though not specifically listed herein.

For example, the standard fire test procedure for building construction and materials originating in a committee of the American Society for Testing Materials and issued as

ASTM E119—Methods of Fire Tests of Building Construction and Materials is also published by the National Fire Protection Association and issued as

NFPA 251—Standard Methods of Fire Tests of Building Construction and Materials and by Underwriters' Laboratories, Incorporated, which issues it as

UL 263—Standards for Fire Tests of Building Construction and Materials.

In addition to the standards listed, there are a number of listings of materials, devices, products and assemblies that are accepted for specified performances. Among such listings which are generally recognized in the Abridged Building Code are:

Test reports; inspection service; lists of building materials, fire protection and extinguishing equipment and devices; and electrical equipment, issued by **UNDERWRITERS' LABORATORIES, INC.**

Test investigations; reports and lists of fire protection equipment; special hazards; electrical equipment; building construction and mill fire prevention organizations, issued by **FACTORY MUTUAL LABORATORIES.**

Building Materials and Structures report on Fire-Resistance Classifications of Building Constructions (BMS92) issued by NATIONAL BUREAU OF STANDARDS.

Fire-Resistance Ratings of Construction Assemblies issued by NATIONAL BOARD OF FIRE UNDERWRITERS.

Approved Fire-Resistance Ratings of Assemblies of Common Materials (columns; beams, girders and trusses; walls and partitions; floor and roof assemblies) recognized in the Basic and Abridged Building Codes, issued by BUILDING OFFICIALS CONFERENCE OF AMERICA, INC.

Material Approval Structural Bureau Reports of recommended approval of specific performance of trade-name products issued by BUILDING OFFICIALS CONFERENCE OF AMERICA, INC.

APPENDIX A

ACCREDITED AUTHORITATIVE AGENCIES

AA	Aluminum Association 420 Lexington Avenue, New York 17, New York
ACI	American Concrete Institute 18263 W. McNichols Road, Detroit 19, Michigan
ACPA	Asbestos Cement Products Association 509 Madison Avenue, New York 22, New York
AGA	American Gas Association 420 Lexington Avenue, New York 17, New York
AHM	Appalachian Hardwood Manufacturers, Inc. 1015 Mercantile Library Building, 414 Walnut Street Cincinnati 2, Ohio
AIA	American Institute of Architects 1741 New York Avenue, NW., Washington 6, D. C.
AIEE	American Institute of Electrical Engineers 33 West 39th Street, New York 18, New York
AISC	American Institute of Steel Construction, Inc. 101 Park Avenue, New York 17, New York
AIISI	American Iron and Steel Institute 150 East 42nd Street, New York 17, New York
AITC	American Institute of Timber Construction 1757 K Street, NW., Washington 6, D. C.
AMA	Accoustical Materials Association 335 E. 45th Street, New York 17, New York
APHA	American Public Health Association 1790 Broadway, New York 17, New York
API	American Petroleum Institute 1625 K Street, NW., Washington 5, D. C.
ARI	Air-Conditioning and Refrigeration Institute 1346 Connecticut Avenue, NW., Washington 6, D. C.
AS - NS	Army, Navy and Air Force Specifications Superintendent of Documents, Government Printing Office, Washington 25, D. C. Commanding General, Air Material Command, Wright-Patterson Air Force Base, Dayton, Ohio
ASA	American Standards Association, Inc. 10 East 40th Street, New York 16, New York
ASCE	American Society of Civil Engineers 33 West 39th Street, New York 18, New York
ASHAE	American Society of Heating and Air-Conditioning Engineers 29 West 39th Street, New York 18, New York
ASHVE	American Society of Heating and Ventilating Engineers 51 Madison Avenue, New York 10, New York
ASME	American Society of Mechanical Engineers 29 West 39th Street, New York 18, New York
ASRE	American Society of Refrigerating Engineers 40 West 40th Street, New York 18, New York
ASSE	American Society of Sanitary Engineering 4328 S. Western Avenue, Chicago 9, Illinois
ASTM	American Society for Testing Materials 1916 Race Street, Philadelphia 2, Pennsylvania
AUBLS	American Uniform Boiler Law Society 95 Liberty Street, New York 6, New York
AVATI	Asphalt and Vinyl Asbestos Tile Institute 101 Park Avenue, New York 17, New York
AWMA	Aluminum Window Manufacturers Association 209 Cedar Avenue, Tacoma Park, Washington 12, D. C.
AWPA	American Wood Preservers Association 839—17th Street, NW., Washington 6, D. C.
AWPI	American Wood Preserving Institute 111 West Washington Street, Chicago 2, Illinois

AWS	American Welding Society 23 West 39th Street, New York 18, New York
AWWA	American Water Works Association 500 Fifth Avenue, New York 18, New York
BOCA	Building Officials Conference of America, Inc. 1525 East 53rd Street, Chicago 15, Illinois
BPI	Building Products Institute Shoreham Building—Room 1032, Washington 5, D. C.
BRAB	Building Research Advisory Board, National Research Council 2101 Constitution Avenue, Washington 25, D. C.
BY & D	Bureau of Yards and Docks Navy Department, Washington 25, D. C.
CAA	Civil Aeronautics Administration Washington 25, D. C.
CBRA	Copper and Brass Research Association 420 Lexington Avenue, New York 17, New York
CIA	Cork Institute of America 25 West 43rd Street, New York 18, New York
CIPRA	Cast Iron Pipe Research Association 122 South Michigan Avenue, Chicago 3, Illinois
CPA	Clay Products Association 111 West Washington Street, Chicago 26, Illinois
CRSI	Concrete Reinforcing Steel Institute 38 South Dearborn Street, Chicago 3, Illinois
CS	Commercial Standards (U.S. Dept. of Commerce) Superintendent of Documents, Government Printing Office Washington 25, D. C.
CSI	Cast Iron Institute P. O. Box 606, New Haven 3, Connecticut
CSPA	Clay Sewer Pipe Association 50 Broad Street—Suite 1902, Columbus 15, Ohio
DFPA	Douglas Fir Plywood Association Tacoma Building, Tacoma 2, Washington
FLAO	Finishing Lime Association of Ohio Home Bank Building, Toledo 4, Ohio
FML	Factory Mutual Laboratories (Associated Factory Mutual Fire Ins. Co.) 184 High Street, Boston 10, Massachusetts
FPL	Forest Products Laboratory Madison 5, Wisconsin
FTI	Facing Tile Institute 1756 K Street, NW., Washington 6, D. C.
FS	Federal Specifications Supt. of Documents, Government Printing Office, Washington 25, D. C.
GA	Gypsum Association 20 North Wacker Drive, Chicago 6, Illinois
GOAA	General Outdoor Advertising Association 22 Grand Street, New Rochelle, New York
GSC	Gymnasium Seating Council 562 South Michigan Avenue, Chicago 3, Illinois
HHFA	Housing and Home Finance Agency Division of Standards, Building Codes and Materials Washington 25, D. C.
HPACA	Heating, Piping and Air-Conditioning Association 1250 Avenue of the Americas, New York 20, New York
HPI	Hardwood Plywood Institute P. O. Box 6246 Shirlington Station, Arlington, Virginia
IAEI	International Association of Electrical Inspectors 612 North Michigan Avenue, Chicago 11, Illinois
IBI	Insulation Board Institute 111 West Washington Street, Chicago 2, Illinois

IBRM	Institute of Boiler and Radiator Manufacturers 60 East 42nd Street, New York 17, New York
ICBO	International Conference of Building Officials 610 South Broadway, Los Angeles, California
IES	Illuminating Engineers Society 51 Madison Avenue, New York 10, New York
ILI	Indiana Limestone Institute Box 308, Bedford, Indiana
JAN	Joint Army - Navy Specifications Bureau of Supplies and Accounts, Navy Dept., Washington 25, D. C. Air Material Command, Wright-Patterson Air Force Base, Dayton, Ohio
LIA	Lead Industries Association 420 Lexington Avenue, New York 18, New York
LPGA	Liquefied Petroleum Gas Association 11 West 42nd Street, New York 17, New York
MCA	Manufacturing Chemists' Association, Inc. 1825 Connecticut Avenue NW., Washington 6, D. C.
MIA	Marble Institute of America, Inc. 108 Forster Avenue, Mount Vernon, New York
MLMA	Metal Lath Manufacturers Association Engineers Building, Cleveland 14, Ohio
MRDTI	Metal Roof Deck Technical Institute 1210 East Ferry Street, Buffalo 11, New York
MWI	Metal Window Institute Cheltenham, Philadelphia, Pennsylvania
NAHB	National Association of Home Builders 1625 L Street, NW., Washington 6, D. C.
NAOM	National Association of Ornamental Metal Manufacturers 209 Cedar Avenue, Tacoma Park, Washington 12, D. C.
NBBI	National Board of Boiler and Pressure Vessel Inspectors 1004 Brunson Building, Columbus 15, Ohio
NBFU	National Board of Fire Underwriters 85 John Street, New York 7, New York
NBGQA	National Building Granite Quarries Association, Inc. 115 East 40th Street, New York 16, New York
NBS	National Bureau Standards (Dept. of Commerce) Supt. of Documents, Government Printing Office, Washington 25, D. C.
NCMA	National Concrete Masonry Association 38 South Dearborn Street, Chicago 3, Illinois
NCPM	National Clay Pipe Manufacturers, Inc. 1820 N Street, NW., Washington 6, D. C.
NEMA	National Electrical Manufacturers Association 155 East 45th Street, New York 17, New York
NEMI	National Elevator Manufacturing Industry 101 Park Avenue, New York 17, New York
NESA	National Electric Sign Association 224 South Michigan Avenue, Chicago 4, Illinois
NFPA	National Fire Protection Association 60 Batterymarch Street, Boston 10, Massachusetts
NHPMA	Northern Hardwood and Pine Manufacturers Association 207 Northern Building, Green Bay, Wisconsin
NLA	National Lime Association 927—15th Street, NW., Washington 5, D. C.
NLMA	National Lumber Manufacturers Association 1319—18th Street, NW., Washington 6, D. C.
NMDA	National Metalclad Door Association, Inc. 8 Winspear Avenue, Buffalo 14, New York
NMWA	National Mineral Wool Association 1270 Sixth Avenue, New York 20, New York
NPVLA	National Paint, Varnish and Lacquer Association 1500 Rhode Island Avenue, NW., Washington 5, D. C.

NRC	National Research Council of Canada Division of Building Research, Ottawa, Ontario, Canada
NS	Navy Specifications Bureau of Supplies & Accounts, Navy Department, Washington 25, D. C.
NSPE	National Society of Professional Engineers 1121—15th Street, NW., Washington 5, D. C.
NWAHACA	National Warm Air Heating and Air Conditioning Association 640 Engineers Building, Cleveland 14, Ohio
PCA	Portland Cement Association 33 West Grand Avenue, Chicago 10, Illinois Research and Development, 5240 Harrison Street, Skokie, Illinois
PEI	Porcelain Enamel Institute 1010 Vermont Avenue, Washington 5, D. C.
PFS	Plywood Fabricator Service, Inc. an affiliate of the Douglas Fir Plywood Association 3500 East 118th Street, Chicago, Illinois
PHMI	Prefabricated Home Manufacturers Institute Shoreham Building, Washington 5, D. C.
PHS	Public Health Service Federal Security Agency, Washington 25, D. C.
PI	Perlite Institute 45 West 45th Street, New York 36, New York
PTL	Pittsburgh Testing Laboratory 1330 Locust Street, Pittsburgh 19, Pennsylvania
RCSB	Red Cedar Shingle Bureau 5508 White Building, Seattle, Washington
RSBA	Rail Steel Bar Association 38 South Dearborn Street, Chicago 3, Illinois
SBCC	Southern Building Code Congress 750 Brown-Marx Building, Birmingham, Alabama
SCPI	Structural Clay Products Institute 1520—18th Street, NW., Washington 6, D. C.
SHP	Southern Hardwood Producers, Inc. 805 Sterick Building, Memphis 3, Tennessee
SJI	Steel Joist Institute 1346 Connecticut Avenue, NW., Washington 6, D. C.
SPA	Southern Pine Association National Bank of Commerce Building, New Orleans 4, Louisiana
SPR	Simplified Practice Recommendations (U.S. Dept. of Commerce) Supt. of Documents, Government Printing Office, Washington 25, D. C.
TCA	Tile Council of America 800 Second Avenue, New York 17, New York
TECO	Timber Engineering Company 1319—18th Street, NW., Washington 6, D. C.
ULI	Underwriters' Laboratories, Inc. 207 East Ohio Street, Chicago 11, Illinois
USDA	United States Department of Agriculture Washington 25, D. C.
USDC	United States Department of Commerce Construction Division, Washington 25, D. C.
USFS	United States Forest Service Madison 5, Wisconsin
VA	Vermiculite Association Rego Park, New York
VI	Vermiculite Institute 208 South LaSalle Street, Chicago 4, Illinois

WCLA West Coast Lumbermen's Association
 1410 SW Morrison Street, Portland 5, Oregon
 WPOA Western Plumbing Officials Association
 P. O. Box 75271, Los Angeles 5, California
 WRI Wire Reinforcement Institute
 National Press Building, Washington 4, D. C.

APPENDIX B-1

ACCEPTED ENGINEERING PRACTICE STANDARDS

See also appendixes, C, D, E, F, and G for standards on specific materials or tests of units or assemblies, some of which include engineering practice standards for specific applications.

High Hazard materials handling and storage; fire protection devices; heating equipment rules, specifications and standards	NFPA
Also published by	NBFU
National Fire Codes; Handbook of Fire Protection; standards and reports.....	NFPA
Technical bulletins of building construction data	HHFA

CONCRETE

Floor and Roof Units, Precast Concrete—Minimum Standard	
Requirements for	ACI 711—1958
Gypsum Concrete, Reinforced—Specifications for	ASA A 59.1—1954
Reinforced Concrete—Standard Requirements for	ACI 318—1956

ELECTRICAL ILLUMINATION

Daylighting—Recommended Practices of	IES—1950
Electrical Code—National	NFPA No. 70—1958
Electrical Safety Code—National	NBS Handbook H 30
Farmstead Wiring	IES—1950
Home Lighting—Recommended Practice	IES—1953
Industrial Lighting	ASA A 11.1—1952
Lighting Handbook	IES—1952
Lighting Performance for Residence Luminaries.....	IES—1946
Measuring Illumination in Buildings—Standard Method for.....	IES—1948
Office Lighting—Recommended Practice	IES—1947
Residence Lighting—Recommended Practice	IES—1953
School Lighting—Recommended Practice	IES—1948
and AIA 31-F—1928	
Wiring Handbook—Residential	IES—1947

EQUIPMENT

Air Conditioning and Ventilating

Air Conditioning and Ventilating Systems of other than Residence Type	NFPA 90A—1960
Air Conditioning Systems, Warm Air Heating and—Residence Type	NFPA 90B—1960
Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying	NFPA 91—1949
Heating, Warm Air, and Air Conditioning Systems, Residence Type	(See Air Conditioning Systems)
Residence Type—Warm Air Heating and Ventilating Systems	(See Air Conditioning Systems)
Warm Air Heating and Air Conditioning Systems, Residence Type	(See Air Conditioning Systems)
Also NWAHACA 4th Ed.—1948	

Elevators and Lifts

Automotive Lifts	USDC CS 142—1951
Elevators, Dumbwaiters, and Escalators—Safety Code for	ASA A 17.1—1960
Manlifts—Safety Code for	ASA A 90.1—1949

Heating

Boiler Code and Unfired Pressure Vessel Code	ASME—1952
Central Heating Gas Appliances—Approved Requirements for—Gravity and Fan Type Floor Furnaces	ASA Z 21.13.3—1959
—Gravity and Fan Type Vented Recessed Heaters	ASA Z 21.13.4—1959
—Gravity and Forced Air Central Furnaces	ASA Z 21.13.2—1958
—Steam and Hot Water Boilers	ASA Z 21.13.1—1958
Gas-Burning Equipment in Power Boilers—Requirements for Installation of	ASA Z 21.33—1950
Gas-Fired Duct Furnaces—Approved Requirements for.....	ASA Z 21.34—1959
Gas Floor Furnaces, Gravity Circulating Type	USDC CS 99—1952
Gas-Fired Room Heaters—Approved Requirements for	ASA Z 21.11—1959

- Gas Piping and Gas Appliance—Installation of(See Plumbing and Piping)
- Gravity Warm Air Heating SystemsASHVE—1953
- Heating, Ventilating and
 - Air Conditioning(See Air Conditioning and Ventilating)
- High Pressure BoilersASME Boiler Code—1952
- Low Pressure BoilersHPACA Std.—1948
- Oil Burners, Automatic Mechanical Draft Designed for
 - Domestic InstallationUSDC CS 75—1942
- Oil Burning Floor Furnaces Equipped with Vaporizing
 - Pot Type BurnersUSDC CS 113—1951
- Residence Type—Warm Air Heating and
 - Air Conditioning Systems(See Air Conditioning and Ventilating)
- Solid Fuel Burning Forced Air FurnacesUSDC CS 109—1947
- Warm Air Heating and
 - Air Conditioning Systems(See Air Conditioning and Ventilating)
- Plumbing and Piping (Gas or Water)**
 - Gas Piping and Gas Appliances—Installation ofASA Z 21.30—1959
 - Gas Piping in Buildings, Gas Appliances and—Installation of.....NFPA 54—1959
 - National Plumbing CodeASA A 40.8—1955
 - Plumbing Fixtures—Stack Venting for.....NBS BMS 118—1950
- Refrigeration**
 - Mechanical Refrigeration—Safety Code forASRE 15—1958
 - Also ASA B 9.1—1958
- Unclassified—Miscellaneous**
 - Swimming Pools and Other Public Bathing Places, Equipment
 - and Operation—Recommended Practice for DesignAPHA—1949

FIRE PROTECTION AND SAFETY PRACTICES

- Aircraft HangarsNFPA 409—1960
- Building Exits CodeNFPA 101—
 - NOTE: NFPA 101—1960 is acceptable for matters of design of exits not provided for by the BOCA Codes. Finish and construction requirements incorporated therein are not approved.
- Cutting and Welding—Gas Systems forNFPA 51—1960
- Dry Cleaning and Dry Dyeing PlantsNFPA 32—1956
- Dust Explosions and Ignition
 - in Country Grain Elevators—Prevention ofNFPA 64—1959
 - in Flour and Feed Mills and Allied Grain Storage
 - Elevators—Prevention ofNFPA 61C—1959
 - in Industrial Plants—Fundamental Principles
 - for the Prevention ofNFPA 63—1948
 - Pulverized Fuel Systems—Installation and Operation ofNFPA 60—1959
 - in Starch Factories—Prevention ofNFPA 61A—1959
 - in Terminal Grain Elevators—Prevention of Dust Explosions...NFPA 61B—1959
- Fibers, Combustible—Storage and Handling ofNFPA 44—1953
- Film, Motion Picture, Cellulose Nitrate—Storage and Handling of. NFPA 40—1953
- GaragesNFPA 88—1939
- Gas, Liquefied Petroleum at Utility Gas Plants—Storage
 - and Handling ofNFPA 59—1958
- Heating, Ventilating and Air Conditioning(See Equipment—Heating)
- Incinerators, Rubbish HandlingNFPA 82—1960
 - and NFPA 82A—1960
- Liquids, Flammable, CodeNFPA 30—1959
- Outdoor Assembly, Places of (Grandstands and Tents)NFPA 102—1957
- Piers and Wharves—Construction and Protection ofNFPA 87—1954
- Pyroxylin Plastics in Factories Making Articles Therefrom—
 - Storage, Handling and Use ofNFPA 42—1936
- Pyroxylin Plastics in Warehouse and Retail StoresNFPA 43—1940
- Spray Finishing Using Flammable MaterialsNFPA 33—1960

INTERIOR FINISHES

- Gypsum Lathing, Plastering and Furring—Specifications for ...ASA A 42.4—1955
- Gypsum Plastering—Specifications forASA A 42.1—1955
- Gypsum Wallboard Finishes—Specifications forASA A 97.1—1958
- Lathing and Furring, Interior—Specifications for.....(See Gypsum Lathing)
- Marble, Interior—Specifications for.....ASA A 94.1—1948

- Portland Cement Plastering—Specifications forASA A 42.3—1946
 Portland Cement Stucco—Specifications forASA A 42.2—1946
 Vermiculite Plastering and Vermiculite Acoustical Plastic—
 Specifications forVI—1956
- MASONRY**
 Masonry—Standard Requirements forASA A 41.1—1953
 Reinforced Masonry—Standard Requirements forASA A 41.2—1960
- METALS**
 Aluminum
 Design and Fabrication of Structures of Aluminum
 Alloys—Specifications forALCOA—1953
 Construction ManualAA—1959
- STEEL**
 Arc and Gas Welding in Building ConstructionAWS Handbook—1948
 AWS Standard
 Code—1946
 Cold-Formed Steel(See LIGHT GAGE COLD-FORMED STEEL)
Design, Fabrication and Erection of Structural Steel
 for Buildings
 —Specifications forAISC—1949
 ASA A 57.1—1952
 —High Strength Steel Bolts—Specifications for
 Assembly of Structural Joints UsingAISC—1954
 —Plastic Design and Fabrication—Supplemental Rules forAISC—1958
 Gas Systems for Welding and Cutting(See FIRE PROTECTION
 and SAFETY PRACTICES)
- Light Gage Cold-Formed Steel**
 —Design ManualAISI—1956
 —Structural Members—Specifications for the Design ofAISI—1960
- Steel Joist Construction, Open Web**
 —Long Span Series—Standard Specifications forSJI—1953
 —Short Span Series—Standard Specifications forSJI—1955
 ASA A 87.1—1957
- Structural Steel(See DESIGN FABRICATION and ERECTION of)
- WOOD AND WOOD PRODUCTS**
 Lumber, Stress Grade(See STRESS GRADE LUMBER)
 Lumber, Structural Glued Laminated—Inspection Manual forAITC—1955
 Plywood—Methods of Calculating Strength ofUSFS Bul. 1630—1950
 Plywood, Fir—Technical Data HandbookDFPA—1960
 Plywood Beams—Specifications for Design and Fabrication ofDFPA Spec.
 No. BB-8—1959
 Plywood-Lumber Structural Assemblies—Specifications for
 Design ofDFPA Spec.
 No. 1—1959
 Plywood Panels, Curved—Specifications for Design ofDFPA Spec.
 No. CP-8—1959
 Stress Grade Lumber and Its Fastenings—National Design
 Specifications forNLMA—1960
 Structural Design Data—WoodNLMA—1957
 Timber Construction StandardsAITC—1956
- UNCLASSIFIED-MISCELLANEOUS**
 Arc and Gas Welding in Building Construction(See METALS-STEEL)
 Building Codes—Administrative Requirements forASA A 55.1—1948
 Building Codes—Preparation and Revision ofNBS BMS 116—1949
 Building Construction—Safety Code forASA A 10.2—1944
 Building Materials—Coordination of Dimensions ofASA A 62.1—1957
 Dwelling, New—Construction Standards forNBS BMS 107—1947
 Floor and Wall Openings,
 Railings, and Toe Boards—Safety Code forASA A 12—1932
 Floors—Waterproofing ofNFPA 92—1937
 Flue Linings—Sizes ofASA A 62.4—1947
 Fuel Oils—Classification ofUSDC CS 12—1948
 Homes—PrefabricatedUSDC CS 125—1947
 House—Strength ofNBS BMS 109—1948
 Light and Ventilation—Standards forASA A 53.1—1946
 Loads, Minimum Design—Standards forASA A 58.1—1955
 Signs and Outdoor Display Structures—Standards forASA A 60.1—1949

APPENDIX B-2

FIRE TEST AND FLAME SPREAD TEST STANDARDS

COMBUSTIBLE OR NONCOMBUSTIBLE PROPERTIES

Noncombustibility of Elementary Materials—	
Method of Test for Determining.....	ASTM E 136— 59T
Textile Fabrics, Treated—Specifications for	
Fire-Retardant Properties of.....	ASTM D 626— 55T
Wood, Treated—Method of Test for Combustible Properties of	
—by the Crib Test.....	ASTM E 160— 50
—by the Fire Tube Apparatus.....	ASTM E 69— 50

FIRE RESISTANCE PROPERTIES

Building Construction and Materials—Methods of	
Fire Test of.....	ASTM E 119— 58
Ceiling Construction—(See Building Construction)	
Door Assemblies—Methods of Fire Tests of.....	ASTM E 152— 58
Roof Coverings—Methods of Fire Test of.....	ASTM E 108— 58

FLAME SPREAD PROPERTIES

Flame Resistance Tests—Accoustical Units,	
Prefabricated.....	Fed. Spec. SSA 1186— 54
Surface Burning Characteristics of Building Materials—	
Method of Test for.....	ASTM E 84— 59T

FLASH POINT

Fuel Oils, by Pensky-Masters Closed Tester—	
Method of Test for Flash Point.....	ASTM D 93— 58T
Liquids other than Fuel Oil, by Tag Closed Tester—	
Method of Test for Flash Point.....	ASTM D 56— 56
Flash and Fire Points by Cleveland Open Cup—	
Method of Test for.....	ASTM D 92— 57

APPENDIX C

MATERIAL STANDARDS

See also appendix D for standards for tests of specific materials.

CONCRETE

Aggregates, Concrete Specifications for	ASTM C 33—	59
Aggregates, Lightweight, for Structural Concrete—		
Specifications for	ASTM C 330—	59T
Aggregates, Lightweight, for Concrete Masonry Units—		
Specifications for	ASTM C 331—	59T
Aggregates, Lightweight, for Insulating Concrete—		
Specifications for	ASTM C 332—	56T
Floor and Roof Units, Precast Concrete—		
Minimum Standard Requirements for	ACI 711—	53
Gypsum Concrete—Specifications for	ASTM C 317—	55
Masonry Units—Concrete	(See MASONRY)	
Natural Cement—Specifications for	ASTM C 10—	54
Portland Cement, Air-Entraining—Specifications for	ASTM C 175—	59
Portland Cement—Specifications for (High Early Strength)....	ASTM C 150—	59
Ready-Mixed Concrete—Specifications for	ASTM C 94—	58
Reinforcing	(See METALS)	
Waterproof Paper for Curing Concrete—Specifications for	ASTM C 171—	59T

FIRE PROTECTION

Fire Retardant Properties of Treated Textile Fabrics—		
Specifications for	ASTM D 626—	55T

INTERIOR FINISHES

Adhesive—Water Resistant Organic, for Installation of		
Clay Tile	USDC CS 181—	52
Aggregates, Inorganic, for use in Gypsum Plaster—		
Specifications for	ASTM C 35—	59
Gypsum Lath—Specifications for	ASTM C 37—	54
Gypsum and Gypsum Products—Methods of Testing.....	ASTM C 26—	59
Gypsum Partition Tile and Block—Specifications for	ASTM C 52—	54
Gypsum Plasters—Specifications for	ASTM C 28—	59
Gypsum Wallboard—Specifications for	ASTM C 36—	58
Lime, Hydrated, for Masonry Purposes—Specifications for....	ASTM C 207—	49
Lime, Hydrated, Normal Finishing—Specifications for.....	ASTM C 6—	49
Lime, Hydrated, Special Finishing—Specifications for.....	ASTM C 206—	49
Quicklime and Hydrated Lime—Methods of Physical		
Testing of	ASTM C 110—	58
Quicklime for Structural Purposes—Specifications for.....	ASTM C 5—	59
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Aggregate, Fine—Method of Test for Measuring		
Mortar-Making Properties of	ASTM C 87—	58T
Brick, Building—Specifications for	ASTM C 62—	58
Brick, Concrete Building—Specifications for.....	ASTM C 55—	55
Brick, Sand-Lime Building—Specifications for	ASTM C 73—	51
Cement, Masonry—Specifications for	ASTM C 91—	59
Concrete Masonry Units, Hollow Load Bearing—		
Specifications for	ASTM C 90—	59
Concrete Masonry Units, Hollow Non-Load Bearing—		
Specifications for	ASTM C 129—	59
Concrete Masonry Units, Solid Load Bearing—		
Specifications for	ASTM C 145—	59
Glazed Units:—Ceramic Glazed Structural Clay Facing Tile,		
Facing Brick, and Solid Masonry Units—Specifications for....	ASTM C 126—	59T
Gypsum Partition, Tile and Block—Specifications for.....	(See INTERIOR FINISHES)	
Limes	(See INTERIOR FINISHES)	
Structural Clay Tile	(See UNCLASSIFIED)	
Tile, Ceramic Glazed Structural Clay.....	(See GLAZED UNITS)	

METAL

Carbon-Steel Castings Suitable for Fusion Welding for High-Temperature Service—Specifications for	ASTM A 216—59T
Carbon Steel Plates of Structural Quality, Low and Intermediate Tensile Strength—Specifications for, (Plate 2 inches and under in thickness)	ASTM A 283— 58
Carbon Steel Sheets of Structural Quality, Flat-Rolled— Specifications for	ASTM A 245—58T
Carbon Steel Strip, Cold-Rolled—Specifications for	ASTM A 109—59T
Carbon Steel Strip of Structural Quality, Hot-Rolled— Specifications for	ASTM A 303—58T
Castings, Gray Iron—Specification for	ASTM A 48— 56
Electrodes, Mild Steel Arc Welding—Specifications for	ASTM A 233—58T
Nickel Steel, Structural—Specifications for	ASTM A 8— 54
Pipes, Welded and Seamless Pipe—Specifications for	ASTM A 252— 59
Pipe, Metal	(See PLUMBING and PIPING)
Reinforcement, Axle-Steel Bars for Concrete— Specifications for	ASTM A 160—57T
Reinforcement, Billet-Steel Bars for Concrete— Specifications for	ASTM A 15—58T
Reinforcement, Rail-Steel Bars for Concrete— Specifications for	ASTM A 16—59T
Reinforcement, Steel Bars for Concrete, Minimum requirements for the Deformation of Deformed—Specifications for	ASTM A 305—56T
Reinforcement, Steel Wire, Cold-Drawn, for Concrete— Specifications for	ASTM A 82—58T
Reinforcement—Steel Wire, Welded Fabric, for Concrete— Specifications for	ASTM A 185—58T
Rivet Steel, Structural, High-Strength—Specifications for	ASTM A 195— 59
Rivet Steel, Structural—Specifications for	ASTM A 141— 58
Rods, Gas Welding, for Iron and Steel—Specifications for	ASTM A 251—46T
Silicon Steel, Structural—Specifications for	ASTM A 94— 54
Steel Castings for Structural Purposes, High Strength— Specifications for	ASTM A 148— 58
Steel Structural, High Strength Low Alloy—Specifications for	ASTM A 242— 55

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Asbestos-Cement Non-Pressure Sewer Pipe—Specifications and Test for	ASTM C 428—58T
Asbestos-Cement Pressure Pipe—Specifications and Test for	ASTM C 296— 59
Brass Pipe, Seamless Red Brass—Specifications for	ASTM B 43— 58
Cast Iron Pipe —Pressure—Specifications for	ASTM A 377— 57
—Soil Pipe and Fittings—Specifications for	ASTM A 74— 42
Clay Pipe —Drain Tile—Specifications for	ASTM C 4—59T
—Extra Strength—Specifications for	ASTM C 200—59T
—Sewer, Standard Strength Ceramic Glazed or Unglazed— Specifications for	ASTM C 261—59T
—Sewer, Standard Strength—Specifications for	ASTM C 13—57T
Concrete Pipe —Culvert Storm Drain and Sewer, Reinforced— Specifications for	ASTM C 76—59T
—Sewer—Specifications for	ASTM C 14— 59
Copper Pipe —Seamless, Standard Sizes—Specifications for	ASTM B 42— 58
Fiber Pipe, Bituminized Drain and Sewer	USDC CS 116— 44
Iron Pipe, Welded and Seamless Open Hearth— Specifications for	ASTM A 253— 58
Lead Pipe	USDC CS 95— 41
Steel Pipe —Black and Hot Dipped Zinc Coated (Galvanized) Welded and Seamless, for Ordinary Uses—Specifications for	ASTM A 120—57T
—Steel or Iron, Special—Welded—Specifications for	ASTM A 211— 54
—Welded and Seamless—Specifications for	ASTM A 53—59T

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—Brass, Seamless—Specifications for.....	ASTM B 135— 58
—Copper, Seamless—Specifications for.....	ASTM B 75— 59
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Valves, Flanges and Pipe Fittings, Gray Iron Castings—	
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Asphalt for Use in Constructing Built-Up Roof Coverings—	
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Asphalt Roll Roofing Surfaced with Powdered Talc or Mica—	
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Asphalt Shingles Surfaced with Mineral Granules—	
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Asphalt Siding Surfaced with Mineral Granules—	
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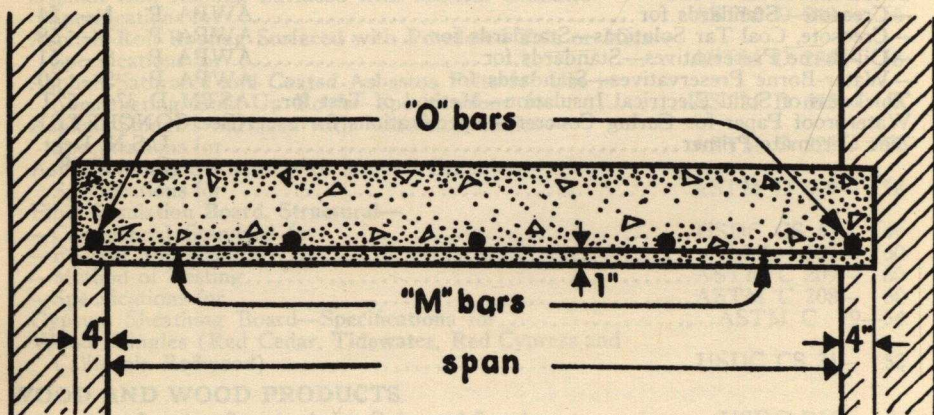
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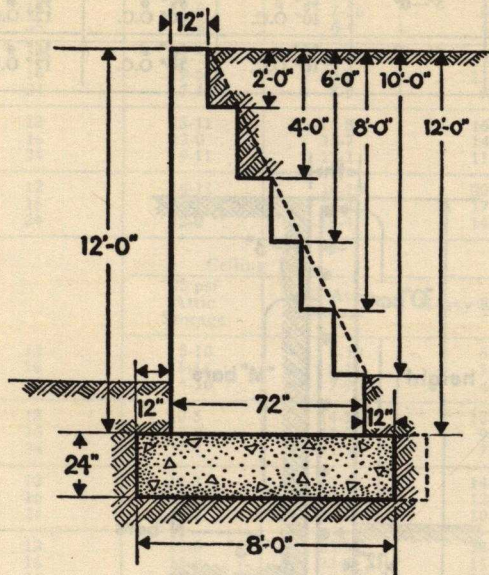
APPENDIX D-1.—ONE- AND TWO-WAY CONCRETE SLABS
Live load 40 pounds per square foot

Span in feet	Depth in inches	One-way slabs		Two-way slabs	
		"M" bars	"O" bars	"M" bars	"O" bars
6	4	$\frac{3}{8}$ " ϕ —10" O.C.	$\frac{1}{4}$ " ϕ —6" O.C.	$\frac{3}{8}$ " ϕ —12" O.C.	$\frac{3}{8}$ " ϕ —12" O.C.
8	4	$\frac{3}{8}$ " ϕ —8" O.C.	$\frac{1}{4}$ " ϕ —6" O.C.	$\frac{3}{8}$ " ϕ —10" O.C.	$\frac{3}{8}$ " ϕ —10" O.C.
10	6	$\frac{3}{8}$ " ϕ —6" O.C.	$\frac{3}{8}$ " ϕ —12" O.C.	$\frac{1}{2}$ " ϕ —15" O.C.	$\frac{1}{2}$ " ϕ —15" O.C.
12	6	$\frac{1}{2}$ " ϕ —8" O.C.	$\frac{3}{8}$ " ϕ —12" O.C.	$\frac{1}{2}$ " ϕ —10" O.C.	$\frac{1}{2}$ " ϕ —10" O.C.
14	8	$\frac{5}{8}$ " ϕ —10" O.C.	$\frac{3}{8}$ " ϕ —8" O.C.	$\frac{1}{2}$ " ϕ —12" O.C.	$\frac{1}{2}$ " ϕ —12" O.C.
16	8	$\frac{5}{8}$ " ϕ —8" O.C.	$\frac{3}{8}$ " ϕ —8" O.C.	$\frac{5}{8}$ " ϕ —12" O.C.	$\frac{5}{8}$ " ϕ —12" O.C.



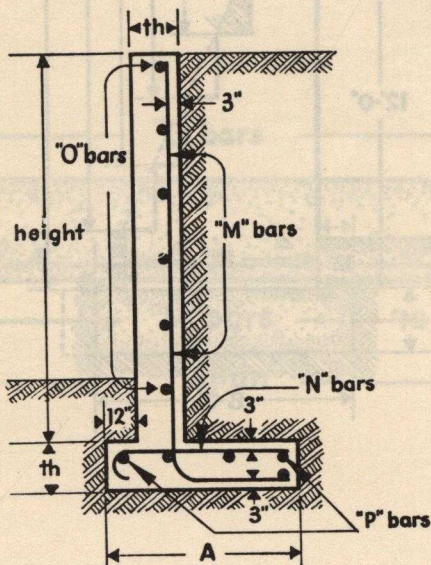
APPENDIX D-2.—SOLID MASONRY RETAINING WALLS

Height in feet	Top thickness in inches	Bottom thickness in inches	Base width in feet	Base thickness in inches
6	12	36	5'-0"	13
8	12	48	6'-0"	16
10	12	60	7'-0"	20
12	12	72	8'-0"	24



APPENDIX D-3.—CANTILEVER RETAINING WALLS

Height in feet	Thickness in inches	Base "A" in feet	Reinforcing bars			
			"M"	"N"	"O"	"P"
6	10	3'-0"	$\frac{3}{8}$ " ϕ 12" O.C.	$\frac{3}{8}$ " ϕ 12" O.C.	$\frac{3}{8}$ " ϕ 12" O.C.	$\frac{3}{8}$ " ϕ 12" O.C.
8	12	4'-0"	$\frac{1}{2}$ " ϕ 12" O.C.	$\frac{1}{2}$ " ϕ 12" O.C.	$\frac{3}{8}$ " ϕ 12" O.C.	$\frac{3}{8}$ " ϕ 12" O.C.
10	14	5'-0"	$\frac{5}{16}$ " ϕ 10" O.C.	$\frac{5}{16}$ " ϕ 10" O.C.	$\frac{3}{8}$ " ϕ 12" O.C.	$\frac{3}{8}$ " ϕ 12" O.C.
12	16	6'-0"	$\frac{3}{4}$ " ϕ 10" O.C.	$\frac{3}{4}$ " ϕ 10" O.C.	$\frac{3}{8}$ " ϕ 12" O.C.	$\frac{3}{8}$ " ϕ 12" O.C.



APPENDIX D-4.—MAXIMUM SPANS OF JOISTS, BEAMS AND RAFTERS

TABLE 8.—MAXIMUM CLEAR SPANS IN FEET OF JOISTS, BEAMS AND RAFTERS

Based on "E" of 1,000,000 and "f" of 600 psi

Nominal Size	Spacing c to c	Floor Joists		Low Slope Roof Joists (x)	
		40 psf Live Load	30 psf Live Load	Supporting Finished Ceiling	Not Supporting Finished Ceiling
2 x 6	12	8-1	9-0	9-8	10-5
	16	7-0	7-10	8-4	9-0
	24	5-8	6-4	6-10	7-4
2 x 8	12	11-1	12-4	13-2	14-3
	16	9-6	10-8	11-5	12-4
	24	7-10	8-9	9-4	10-1
2 x 10	12	13-11	15-8	16-8	18-0
	16	12-0	13-7	14-5	15-8
	24	9-11	11-1	11-10	12-9
2 x 12	12	16-11	18-10	20-2	21-10
	16	14-7	16-4	17-6	18-11
	24	12-0	13-4	14-3	15-5
		Ceiling Joists		Rafters (x)	
		20 psf Attic Storage	No Attic Storage	Heavy Roofing	Light Roofing
2 x 4	12	5-10	9-10	6-10	8-0
	16	5-11	8-11	5-11	6-11
	24	4-10	7-9	4-0	5-8
2 x 6	12	10-5	14-11	10-5	12-2
	16	9-0	13-7	9-0	10-7
	24	7-4	11-10	7-4	8-7
2 x 8	12	14-3	20-4	14-3	16-7
	16	12-4	18-6	12-4	14-4
	24	10-1	16-2	10-1	11-9
2 x 10	12	18-0	25-9	18-0	21-0
	16	15-8	23-5	15-8	18-3
	24	12-9	20-5	12-9	14-10

(x) Distance is measured along slope.

Table 9 Deleted — No Requirements

Table 10 Deleted — No Requirements

Table 11 Deleted — No Requirements

APPENDIX D-5.—SAFE LOADS

TABLE 12.—SAFE LOADS FOR STRUTS, POSTS AND COLUMNS
Thousands of pounds, concentric load

Size of member			Unsupported height in feet													
Size in inches	Area in square inches	2	4	6	8	10	12	14	16	18	20	25	30	35	40	50
2 x 4	5.89	5.0	3.5	1.75	1.0	—	—	—	—	—	—	—	—	—	—	—
2 x 6	9.14	8.0	5.5	2.75	1.5	—	—	—	—	—	—	—	—	—	—	—
4 x 4	13.14	10.0	11.5	10.5	8.0	5.0	4.0	3.0	2.0	—	—	—	—	—	—	—
4 x 6	20.39	19.0	18.0	16.0	12.0	8.0	6.0	5.0	3.0	—	—	—	—	—	—	—
6 x 6	30.25	—	28.0	26.5	25.0	24.0	18.0	14.0	11.0	9.0	7.5	4.5	—	—	—	—
6 x 8	41.25	—	38.0	36.0	34.0	33.0	25.0	21.0	16.5	12.0	10.0	6.0	—	—	—	—
8 x 8	56.25	—	—	50.0	49.0	48.0	46.0	44.0	39.0	34.0	22.5	16.0	11.0	8.0	—	—
8 x 10	71.25	—	—	64.0	62.5	60.0	58.0	56.0	49.0	42.0	28.5	19.0	13.0	10.0	—	—
10 x 10	90.25	—	—	—	82.0	78.5	77.0	75.0	72.0	64.0	55.0	40.5	26.0	20.0	15.0	—
10 x 12	109.25	—	—	—	99.0	96.0	93.0	89.0	87.0	85.0	68.0	43.5	32.0	25.0	18.0	—
12 x 12	132.25	—	—	—	—	118.0	112.0	111.0	110.0	108.0	105.0	80.0	53.0	40.0	33.0	20.0

TABLE 13.—SAFE LOADS FOR FRAME BEARING WALLS AND PARTITIONS
WITH SHEATHING OR PLASTERING ON BOTH SIDES

Thousands of pounds—per foot—concentric load

Size of studs in inches	Spacing in inches	Unsupported Height in Feet												
		7	8	9	10	11	12	14	16	18	20	25	30	35
2 x 2	16	0.5	0.3											
	24	0.3	0.2											
	36	0.2	0.1											
	48	0.15	0.05											
2 x 3	16	1.6	1.3	0.9	0.8	0.6	0.5							
	24	1.1	0.8	0.6	0.5	0.4	0.3							
	36	0.7	0.6	0.5	0.4	0.3	0.2							
	48	0.6	0.5	0.4	0.3	0.2	0.1							
2 x 4	16	3.8	2.6	2.2	1.8	1.5	1.3	1.1	0.7					
	24	2.5	1.8	1.5	1.2	1.0	0.8	0.7	0.4					
	36	1.7	1.2	1.0	0.8	0.7	0.6	0.5	0.3					
	48	1.3	0.9	0.7	0.6	0.5	0.4	0.3	0.2					
3 x 4	16	6.0	4.0	3.5	3.0	2.5	2.0	1.5	1.0					
	24	4.0	3.0	2.5	2.0	1.7	1.5	1.2	0.7					
	36	2.7	1.9	1.6	1.3	1.1	1.0	0.8	0.5					
	48	2.0	1.4	1.2	0.9	0.8	0.7	0.6	0.4					
2 x 6	16	6.0	5.8	5.6	5.5	4.8	4.0	3.4	2.7	2.0	1.7	1.0		
	24	4.0	3.9	3.8	3.7	3.2	2.7	2.3	1.8	1.4	1.1	0.7		
	36	2.6	2.5	2.4	2.3	2.1	1.8	1.5	1.2	0.9	0.8	0.5		
	48	2.0	1.9	1.8	1.7	1.6	1.4	1.1	0.9	0.7	0.6	0.3		
3 x 6	16	9.5	9.4	9.2	8.9	7.7	6.6	5.5	4.4	3.3	2.2	1.7		
	24	6.3	6.1	6.0	5.9	5.2	4.4	3.7	2.9	2.2	1.8	1.1		
	36	4.2	4.1	4.0	3.9	3.4	2.9	2.5	2.0	1.5	1.2	0.7		
	48	3.1	3.0	2.9	2.8	2.6	2.2	1.8	1.5	1.1	0.9	0.6		
4 x 6	16	13.0	12.8	12.6	12.2	10.7	9.1	7.6	6.1	4.6	3.8	2.3		
	24	8.7	8.6	8.4	8.1	7.1	6.0	5.0	4.0	3.0	2.5	1.5		
	36	5.8	5.7	5.6	5.4	4.8	4.1	3.4	2.7	2.0	1.7	1.0		
	48	4.3	4.2	4.1	4.0	3.5	3.0	2.5	2.0	1.5	1.3	0.8		
2 x 8	16	8.2	8.1	8.0	7.8	7.6	7.5	7.3	5.5	4.5	3.5	2.5	1.8	1.4
	24	5.5	5.4	5.3	5.2	5.1	5.0	4.9	3.5	3.0	2.5	1.7	1.2	0.9
	36	3.7	3.6	3.5	3.4	3.3	3.2	3.1	2.5	2.0	1.5	1.2	0.8	0.6
	48	2.7	2.7	2.6	2.6	2.5	2.5	2.4	1.8	1.5	1.2	0.8	0.6	0.5
3 x 8	16	13.3	13.0	12.9	12.7	12.5	12.0	11.8	9.0	7.5	6.0	4.0	3.0	2.0
	24	8.9	8.7	8.6	8.4	8.3	8.1	7.9	5.9	4.9	3.9	2.8	2.0	1.5
	36	5.9	5.8	5.7	5.6	5.5	5.4	5.2	3.9	3.3	2.6	1.8	1.3	1.0
	48	4.4	4.3	4.3	4.2	4.2	4.1	3.9	2.9	2.5	2.0	1.4	1.0	0.7

Appendix E-1:

TABLE 5.—FIRE-RESISTANCE RATINGS OF STRUCTURAL ELEMENTS IN HOURS

STRUCTURAL ELEMENT	TYPE OF CONSTRUCTION											
	TYPE 1		TYPE 2		TYPE 3				TYPE 4			
	FINEPROOF		NONCOMBUSTIBLE		EXTERIOR MASONRY WALLS		FRAME					
			PROTECTED		ORDINARY							
			Unprotected									
		1A	1B	2A	2B	2C	3A	3B	3C	4A	4B	
1	On Street Lot Lines or with Fire Separation of 30' or More from Interior Lot Lines or Any Building	Bearing	4	3	2	3/4	0	2	2	1/2	0	
		Non-Bearing	0	0	0	0	0	0	0	1/2	0	
	On Interior Lot Lines or Less Than 6' Therefrom or From Any Building	Bearing	4	3	2	1 1/2	3/4	2	2	3/4	3/4	
		Non-Bearing	2	2	1 1/2	3/4	Note c	2	2	3/4	3/4	
	6' or More But Less Than 11'	Bearing	4	3	2	3/4	0	2	2	1/2	0	
		Non-Bearing	2	2	1 1/2	3/4	0	2	2	1/2	0	
	11' or More But Less Than 30'	Bearing	4	3	2	3/4	0	2	2	1/2	0	
		Non-Bearing	1 1/2	1 1/2	3/4	3/4	0	See Sec. 217	1 1/2	1 1/2	0	
	Interior Bearing Walls and Partitions		4	3	2	3/4	0	2	3/4	0	0	
		Noncombustible	4	3	2	2	2	2	2	2	2	
3	Fire Walls											
4	Fire Divisions											
5	Fire Enclosure of Exitways, Elevator Hoistways, Public Hallways and Stairways	Note e										
6	Shafts Other Than Stairways											
7	Corridor Partitions & Vertical Separation of Tenant Spaces											
8	Other Non-Bearing Partitions (See Art. 9)											
9	Columns, Girders, Trusses (Other Than Roof Trusses) and Framing	Supporting One Floor	3	2	1 1/2	3/4	0	0	0	0	0	
10	Structural Members Supporting Wall	Supporting More Than One Floor	4	3	2	3/4	0	0	0	0	0	
11	Floor Construction Including Beams—15' or Less in Height	Note i	3	2	1 1/2	3/4	0	0	0	1/2	0	
12	Roof Trusses and Framing, Including Arches and Roof Deck	More than 15' But Less Than 20' in Height to Lowest Member	3/4	3/4	3/4	3/4	0	0	0	1/2	0	
	Note f	20' or More in Height to Lowest Member	0	0	0	0	0	0	0	0	0	

Note a.—The fire separation or fire exposure in feet as herein limited applies to the distance from other buildings on the site, or from an interior lot line or from the opposite side of a street or other public space not less than thirty (30) feet wide to the building wall. (See *Definitions*, section 901.)

Note b.—Protected exteriors shall be required within the fire limits in type 2 construction as follows: high hazard uses, 2-hour fire resistance with fire separation up to 11 feet.

Note c.—One-story buildings of type 2-C construction which do not exceed three thousand (3000) square feet in area in all use groups except high hazard, assembly and institutional shall be exempt from the protected exterior wall requirements of table 5. (See section 302.4.)

Note d.—Party walls in type 4 buildings shall be as follows: 1- and 2-family dwellings, $\frac{3}{4}$ -hour fire resistance. (See section 907.3.) Other uses 2 hours, but not less than the fire grading of the use group. (See table 16.)

Note e.—Stair enclosures in all buildings, other than 1- and 2-family dwellings, which do not exceed three (3) stories or forty (40) feet in height with an occupancy load of less than forty (40) below and less than seventy-five (75) above the grade floor shall be of not less than $\frac{3}{4}$ -hour fire resistance. In buildings of types 3 and 4 construction, such $\frac{3}{4}$ -hour enclosures may be of combustible construction as provided in section 618.93.

Note f.—In all buildings in which the roof framing may be unprotected, roof slabs and decking may be noncombustible without fire-resistance rating except that in buildings not more than five (5) stories in height, roof decking may be of mill type construction or of any other materials providing equivalent fire-resistant and structural properties. (See sections 217 and 915.)

Note g.—Deleted. No requirements.

Note h.—For special high hazard uses involving a higher degree of fire severity and higher concentration of combustible contents, the fire-resistance requirements for structural elements shall be increased accordingly. (See section 400.)

Note i.—In Type 3A construction members which are of material other than heavy timber shall have a fire resistance rating of not less than $\frac{3}{4}$ hour.

Appendix E-2

**TABLE 6.—GENERAL HEIGHT AND AREA LIMITATIONS OF ONE-STORY BUILDINGS
FACING ON ONE STREET OR PUBLIC SPACE NOT LESS THAN 30 FEET WIDE**

Notes a, d and I

Areas in square feet; heights in number of stories and feet

N.P. — NOT PERMITTED
☒ UNLIMITED

USE GROUP		TYPE OF CONSTRUCTION											
		TYPE 1		TYPE 2				TYPE 3				TYPE 4	
		Fireproof		Noncombustible				Exterior Masonry Walls				Frame	
				Protected		Un-protected		(H.T.) Mill		Ordinary (Joisted)		Protected	
		1A	1B	2A	2B	2C	3A	3B	3C	4A	4B		
A	HIGH HAZARD Notes h. and m.	5St. 65' 14 000	3St. 40' 12 000	3St. 40' 7 000	2St. 30' 5 500	1St. 20' 4 000	2St. 30' 6 000	2St. 30' 5 500	1St. 20' 4 000	1St. 20' 3 500	N.P.	1St. 20' 3 500	N.P.
B-1	STORAGE — Moderate Notes b, d, e, f, i, and j.	5St. 65' 21 000	5St. 65' 21 000	5St. 65' 12 250	4St. 50' 9 600	2St. 30' 7 000	4St. 50' 10 500	3St. 40' 9 600	2St. 30' 7 000	2St. 30' 6 100	1St. 20' 5 250	2St. 30' 6 100	1St. 20' 5 250
B-2	STORAGE — Low Notes b, d, e, and f.	12St. 135' 24 000	12St. 135' 24 000	6St. 75' 14 000	4St. 50' 11 000	2St. 30' 8 000	4St. 50' 12 000	4St. 50' 11 000	2St. 30' 8 000	2St. 30' 7 000	1St. 20' 6 000	2St. 30' 7 000	1St. 20' 6 000
C	MERCANTILE Notes b, d, e, and f.	12St. 135' 24 000	12St. 135' 24 000	6St. 75' 14 000	4St. 50' 11 000	2St. 30' 8 000	4St. 50' 12 000	4St. 50' 11 000	2St. 30' 8 000	2St. 30' 7 000	1St. 20' 6 000	2St. 30' 7 000	1St. 20' 6 000
D	INDUSTRIAL Notes b, d, e, and f.	12St. 135' 24 000	12St. 135' 24 000	6St. 75' 14 000	4St. 50' 11 000	2St. 30' 8 000	4St. 50' 12 000	4St. 50' 11 000	2St. 30' 8 000	2St. 30' 7 000	1St. 20' 6 000	2St. 30' 7 000	1St. 20' 6 000
E	BUSINESS Notes b, d, e, and f.	6St. 75' 12 000	4St. 50' 7 000	4St. 50' 7 000	2St. 30' 5 500	1St. 20' 4 000	2St. 30' 6 000	2St. 30' 5 500	1St. 20' 4 000	1St. 20' 3 500	N.P.	1St. 20' 3 500	N.P.
F-1-A	ASSEMBLY THEATRES With stage and scenery Without stage (Motion Picture Theatres)	9St. 100' 21 000	5St. 65' 12 250	3St. 40' 9 600	2St. 30' 7 000	1St. 20' 4 000	3St. 40' 10 500	2St. 30' 9 600	1St. 20' 7 000	1St. 20' 6 100	1St. 20' 5 250	1St. 20' 6 100	1St. 20' 5 250
F-1-B	ASSEMBLY THEATRES With stage and scenery Without stage (Motion Picture Theatres)	4St. 50' 6 000	3St. 40' 3 500	2St. 30' 2 750	1St. 20' 2 000	1St. 20' 1 750	2St. 30' 2 000	1St. 20' 1 750	1St. 20' 1 500	1St. 20' 1 500	1St. 20' 1 500	1St. 20' 1 500	1St. 20' 1 500
F-2	ASSEMBLY — Night Clubs and similar uses	9St. 100' 21 000	5St. 65' 12 250	3St. 40' 9 600	2St. 30' 7 000	1St. 20' 4 000	3St. 40' 10 500	2St. 30' 9 600	1St. 20' 7 000	1St. 20' 6 100	1St. 20' 5 250	1St. 20' 6 100	1St. 20' 5 250
F-3	ASSEMBLY — minals—Restaurants other than Night Clubs Note c	9St. 100' 21 000	5St. 65' 12 250	3St. 40' 9 600	2St. 30' 7 000	1St. 20' 4 000	3St. 40' 10 500	2St. 30' 9 600	1St. 20' 7 000	1St. 20' 6 100	1St. 20' 5 250	1St. 20' 6 100	1St. 20' 5 250
F-4	ASSEMBLY — Schools Churches	9St. 100' 21 000	5St. 65' 12 250	3St. 40' 9 600	2St. 30' 7 000	1St. 20' 4 000	3St. 40' 10 500	2St. 30' 9 600	1St. 20' 7 000	1St. 20' 6 100	1St. 20' 5 250	1St. 20' 6 100	1St. 20' 5 250
H-1	INSTITUTIONAL — Restrained	6St. 75' 15 000	4St. 50' 8 750	2St. 30' 6 900	1St. 20' 5 000	1St. 20' 4 400	2St. 30' 5 000	1St. 20' 4 400	1St. 20' 4 400	1St. 20' 4 400	N.P.	1St. 20' 4 400	N.P.
H-2	INSTITUTIONAL — Incapacitated	8St. 90' 18 000	4St. 50' 10 500	2St. 30' 8 250	1St. 20' 6 000	1St. 20' 5 250	2St. 30' 6 000	1St. 20' 5 250	1St. 20' 4 400	1St. 20' 3 250	N.P.	1St. 20' 4 400	N.P.
L-1	RESIDENTIAL — Hotels	9St. 100' 14 000	4St. 50' 11 000	2St. 30' 8 000	1St. 20' 6 000	1St. 20' 5 250	2St. 30' 6 000	1St. 20' 5 250	1St. 20' 4 400	1St. 20' 3 250	N.P.	1St. 20' 4 400	N.P.
L-2	RESIDENTIAL — Multi-Family	9St. 100' 13 750	4St. 50' 12 400	2St. 30' 9 000	1St. 20' 7 000	1St. 20' 6 000	2St. 30' 7 000	1St. 20' 6 000	1St. 20' 5 250	1St. 20' 4 400	N.P.	1St. 20' 5 250	N.P.
L-3	RESIDENTIAL — 1 & 2 Family	16 600	4St. 50' 13 000	2St. 30' 9 500	1St. 20' 7 000	1St. 20' 6 000	2St. 30' 7 000	1St. 20' 6 000	1St. 20' 5 250	1St. 20' 4 400	N.P.	1St. 20' 5 250	N.P.
M	MISCELLANEOUS & TEMPORARY	16 600	4St. 50' 13 000	2St. 30' 9 500	1St. 20' 7 000	1St. 20' 6 000	2St. 30' 7 000	1St. 20' 6 000	1St. 20' 5 250	1St. 20' 4 400	N.P.	1St. 20' 5 250	N.P.

Note a.—For all buildings with frontages of more than twenty-five (25) per cent of the building perimeter on one or more streets or other accessible public space not less than thirty (30) feet wide, the tabular area may be increased two (2) per cent for each one (1) per cent of such excess. (See section 308.)

Note b.—In use groups B-1, B-2, C, D and E, the tabular areas may be increased two hundred (200) per cent for one (1) story buildings and one hundred (100) per cent for buildings over one (1) story in height when such buildings are equipped with automatic sprinkler systems not specifically required by law. (See section 308.)

Note c.—Eliminated.

Note d.—The maximum total floor area shall not exceed three and one-half ($3\frac{1}{2}$) times the tabular value. (See section 308.3.)

Note e.—In use groups B, C, D, E and F-3, isolated buildings of other than frame construction may be of unlimited areas outside of the fire limits when not more than one (1) story or eighty-five (85) feet in height when complying with specific provisions of the Basic Building Code. See section 309.)

Note f.—In use groups B-1, B-2, C, D and E, types 1, 2 and 3 construction may be increased one (1) story but not more than twenty (20) additional feet in height when equipped with automatic sprinkler systems not specifically required by law. (See section 310.2.)

Note g.—Church auditoriums of type 3-A construction may be erected to sixty-five (65) feet in height and of type 4 construction to forty-five (45) feet in height.

Note h.—For exceptions to height and area limitations of high hazard use buildings, see article 4 governing the specific use. For other special fire-resistive requirements governing specific uses, see section 905.

Note i.—For height and area exceptions covering public parking decks, see section 905.2. ,

Note j.—For height and area exceptions covering petroleum bulk-storage buildings, see section 905.3.

Note k.—For exceptions to height of multi-family dwellings of types 2-B and 3-B construction, see section 905.6.

Note l.—In multi-story buildings, the limiting areas specified in table 6 shall be reduced as regulated by section 307.3.

Note m.—For one-story combustible fibre warehouses, see section 410.17.

Note n.—The tabular area of one-story buildings of use group F-4 classification may be increased fifty (50) per cent provided every classroom has at least one door opening directly to the exterior of the building. Not less than one-half ($\frac{1}{2}$) of the required exits from any assembly room included in such building shall also open directly to the exterior of the building.

APPENDIX F—Recommended Nailing Schedule

<i>Building Element</i>	<i>Nail Type</i>	<i>Number and Distribution</i>
Stud to sole plate.....	Common-toe-nail	3—16d
Stud to cap plate.....	Common-end nail	2—16d
Double studs	Common-direct	10d 12" o.c. or 16d 30" o.c.
Corner studs	Common-direct	16d 30" o.c.
Sole plate to joist or blocking.....	Common	20d 16" o.c.
Double cap plate.....	Common-direct	16d 24" o.c.
Cap plate laps.....	Common-direct	3—16d
Ribbon strip—6" or less.....	Common-direct	2—10d each bearing
Ribbon strip—over 6".....	Common-direct	3—10d each bearing
Roof rafter to plate.....	Common-toe-nail	3—16d
Roof rafter to ridge.....	Common-toe-nail	2—16d
Jack rafter to hip.....	Common-toe-nail	3—10d
Floor joists to studs.....	Common-direct	5—10d or 3—16d
(no ceiling joist)		
Floor joists to studs.....	Common-direct	2—10d
(with ceiling joists)		
Floor joists to sill or girder.....	Common-toe-nail	2—16d
Ledger strip	Common-direct	3—20d at each joist
Ceiling joists to plate.....	Common-toe-nail	2—16d
Ceiling joists to alt. rafters.....	Common-direct	3—16d
Ceiling joists (laps over partition)....	Common-direct	3—16d
Collar beam	Common-direct	4—10d
Bridging to joists.....	Common-direct	2—8d each end
Diagonal brace (to stud & plate)....	Common-direct	2—8d each bearing
Tail beams to headers (when nailing permitted)	Common-end	1—20d each 4 sq. ft. floor area
Header beams to trimmers (when nailing permitted)	Common-end	1—20d each 8 sq. ft. floor area
1" Sub-flooring (6" or less).....	Common-direct	2—8d each joist
1" Sub-flooring (8" or more).....	Common-direct	3—8d each joist
2" Sub-flooring	Common-direct	2—20d each joist
1" Wall sheathing (8" or less in width)	Common-direct	2—8d each stud
1" Wall sheathing (over 8 "in width)	Common-direct	3—8d each stud
Plywood sheathing	Common-direct	6d 6" o.c. exterior edges
		6d 12" o. c. intermediate
1" Roof sheathing (6" or less in width)	Common-direct	2—8d each rafter
1" Roof sheathing (over 6" in width)	Common-direct	3—8d each rafter
½" Fiberboard Sheathing.....		1½" Galvanized Roofing Nail
		6d Common Nail
		16 gage staple, 1½" long with minimum crown of ⅞".
25/32" Fiberboard Sheathing		1¾" Galvanized Roofing Nail
		8d Common Nail
		16 gage staple, 1½" long with minimum crown of ⅞".

Gypsum sheathing	Large head	7—No. 11g. x 1¾" per
	Corrosion resistive	bearing under shingles
		4—per bearing, all other
		cases
Shingles—wood	Corrosion resistive	2—No. 14 B&S each
		bearing
Weather boarding	Corrosion resistive	2—8d each bearing

Shingle nails shall penetrate not less than ¾ inches into nailing strips, sheathing or supporting construction except as otherwise provided in section 855.51.

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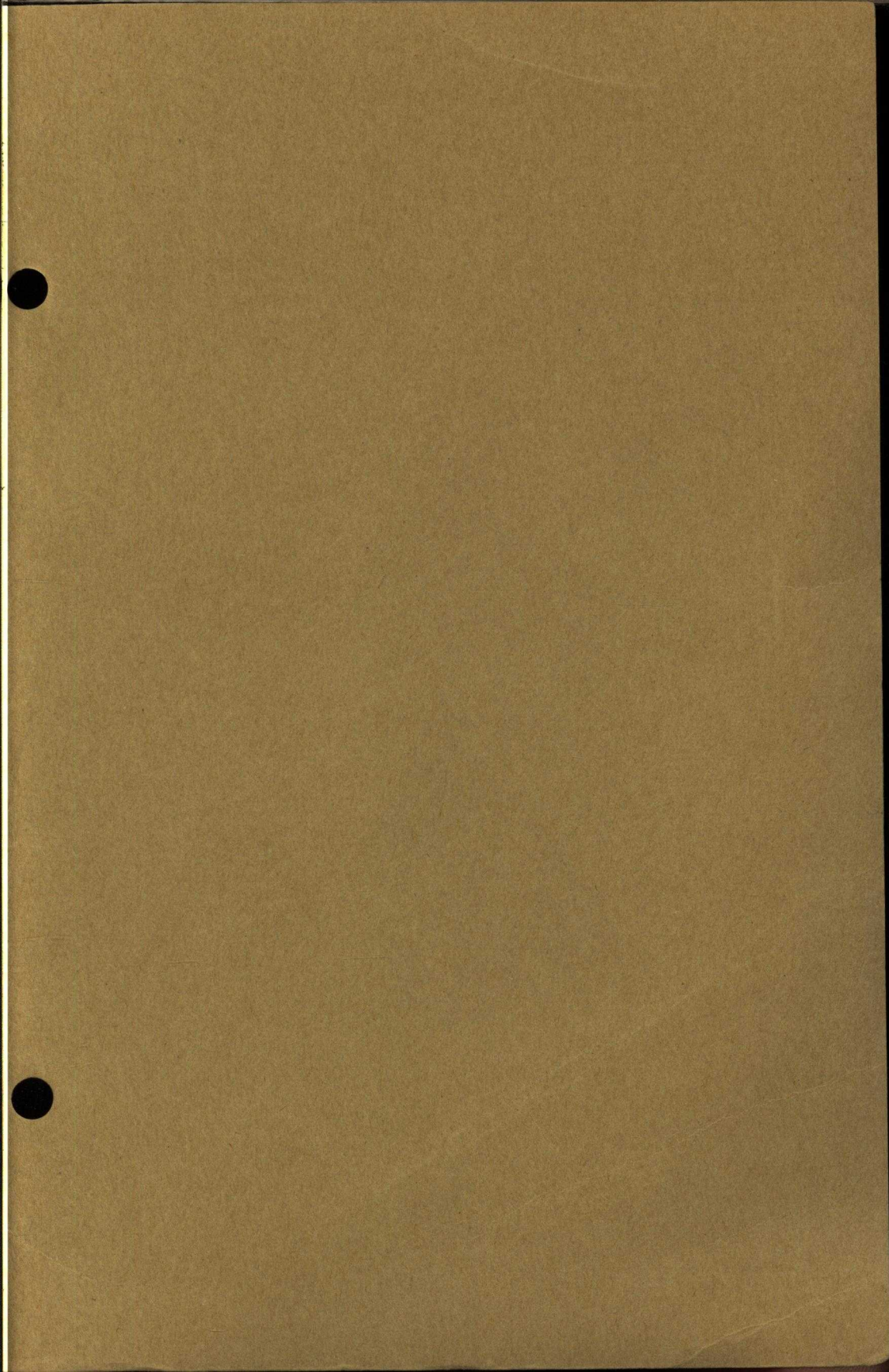
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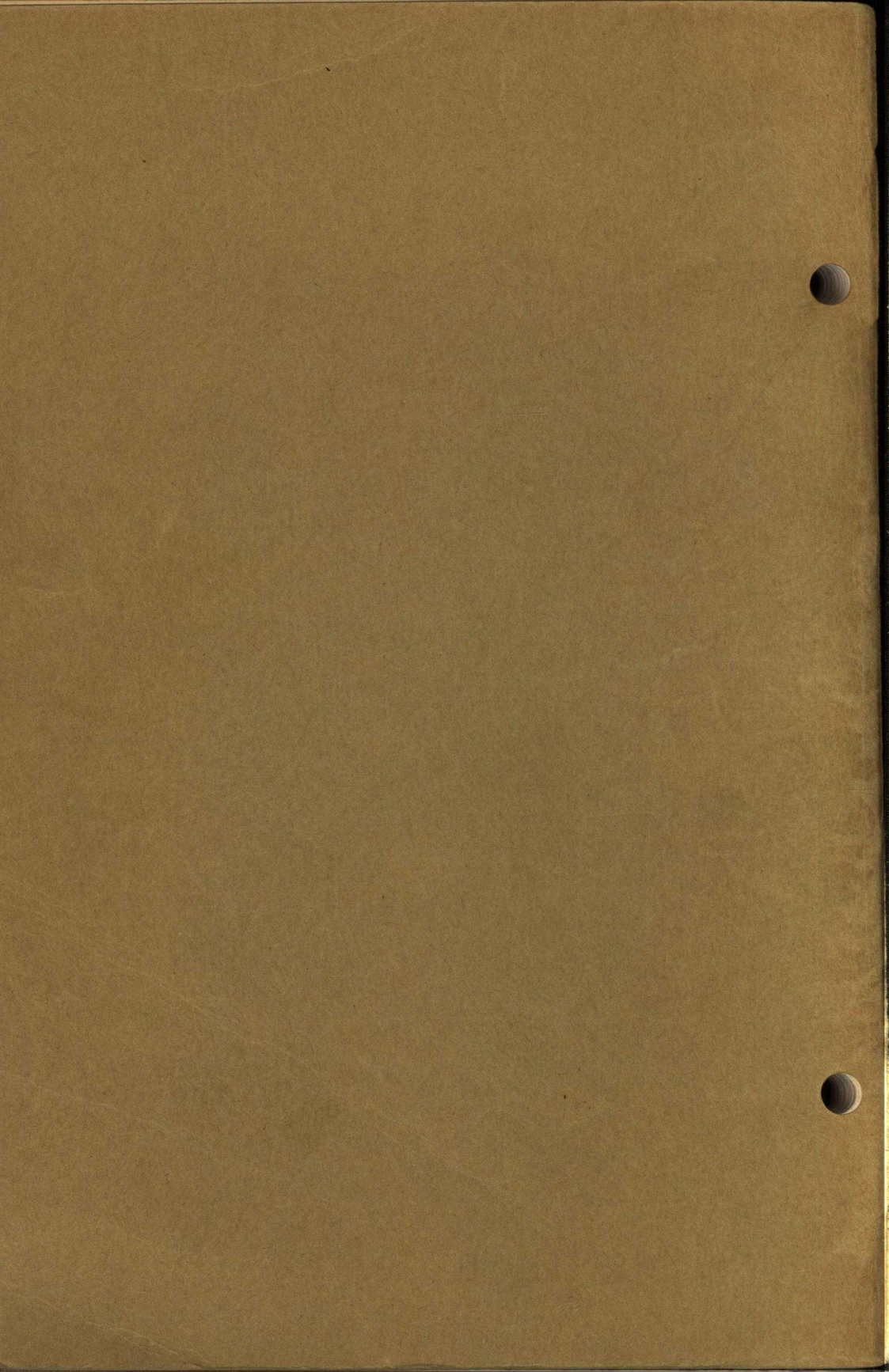
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Recommended by the membership of the

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for the

ABRIDGED BUILDING CODE—1960

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THE BUILDING COMPANY—CHICAGO, ILLINOIS

PREFACE

This supplement to the 1960 edition of the BOCA Building Codes contains changes approved by the membership of the Building Officials Conference of America, Inc., and is recommended to local governments for adoption to bring the codes up to date in line with current progress in the construction industry. Some of these changes represent new technological developments. Their adoption will allow the public the use of new materials resulting from this research.

This supplement is a part of the Building Code Program of the Building Officials Conference of America, Inc., which offers any municipality the most economical method for securing, maintaining and administering a building code. This is a three-fold program which consists of:

1. The adoption of Building Codes by reference, where permitted by statutes, without obligation; with or without amendments, when necessary to adapt them to local conditions;
2. A system of code changes, carefully reviewed to guard against preferential influences and undue pressures and made available annually ready for adoption so as to allow the free use of any product or system;
3. Providing administrative counsel and technical data to assist local officials in rendering better service to the public; this includes evaluation of materials and methods, examination of plans and special surveys and consulting service.

Before being approved, the changes included in this supplement have been reviewed by building officials from all sections of the country. Each change has been carefully processed as follows:

1. Studied by a subcommittee whose members have contributed their best thinking gleaned from their varied experiences and backgrounds;
2. Reviewed by a code changes committee at a public hearing for discussion of facts and arguments for and against each change;
3. Presented in open session of the annual national conference of the organization for debate and final disposition by vote of the Active (building official) Members present.

Full details of this program as well as its many advantages and benefits may be obtained from the executive offices or any officer or member of the association.

cont. 11/22/66

PREFACE

This supplement to the 1960 edition of the BOCA Building Codes contains changes approved by the membership of the Building Officials Conference of America, Inc., and is recommended to local governments for adoption to bring the codes up to date in line with current practice in the construction industry. Some of these changes represent new technological developments. Their adoption will allow the public the use of new materials resulting from this research.

This supplement is a part of the Building Code Program of the Building Officials Conference of America, Inc., which offers any municipality the most economical method for securing, maintaining and administering a building code. This is a three-fold program which consists of:

1. The adoption of Building Codes by reference, where permitted by statute, without obligation, with or without amendments, when necessary to adapt them to local conditions;

2. A system of code changes, carefully reviewed to guard against prejudicial influences and unsafe practices and made available annually ready for adoption so as to allow the free use of any product or system;

3. Providing administrative counsel and technical data to assist local officials in rendering better service to the public; this includes evaluation of materials and methods, examination of plans and special surveys and consulting service.

Before being approved, the changes included in this supplement have been reviewed by building officials from all sections of the country. Each change has been carefully processed as follows:

1. Studied by a subcommittee whose members have contributed their best thinking gleaned from their varied experience and backgrounds;

2. Reviewed by a code changes committee as a public hearing for discussion of facts and arguments for and against each change;

3. Presented in open session of the annual national conference of the organization for debate and final disposition by vote of the Active (building official) Members present.

Full details of this program as well as its many advantages and benefits may be obtained from the executive office or any office or member of the association.

APPROVED CHANGES—1961-1962-1963-1964

Recommended by the membership of the Building Officials

Conference of America for the

ABRIDGED BUILDING CODE—1960

Sec. 101.0. (S2-61 Pt. 1). (S35-61. Pt. 1).

Add the following definitions:

mobile home. A one-family dwelling unit of vehicular, portable design built on a chassis and designed to be moved from one site to another and to be used without a permanent foundation.

travel trailer. A vehicular, portable structure built on a chassis and designed to be used for temporary occupancy for travel, recreational or vacation use; with the manufacturer's permanent identification "Travel Trailer" thereon; and when factory equipped for the road, being of any length provided its gross weight does not exceed forty-five hundred (4500) pounds, or being of any weight provided its overall length does not exceed twenty-eight (28) feet.

type L Low-temperature. A vent system consisting of factory-made piping and fittings for use with fuel burning appliances listed as exhausting, low-temperature combustion products containing a minimum of excess air.

low-temperature flue gas oil burning equipment. Fuel-burning appliances listed as exhausting low-temperature combustion products containing a minimum of excess air and listed for use with Type L low-temperature vent systems.

Sec. 102.51. (S2-61 Pt. 2).

Add new section as follows:

102.51. Mobile Living Units.—Travel trailers and mobile homes, as defined in section 101, and similar units designed to be transported from one location to another and not mounted on a permanent foundation, shall comply with the applicable standards listed in appendix B and the specific requirements of section 425 and the subsections thereof of the Basic Code. Whenever any such unit shall be placed upon a permanent foundation or on foundation piers it shall be made to comply with all of the requirements of this code for single-family dwellings.

Parking facilities and use of such units for temporary or permanent occupancy shall comply with the applicable requirements of section 425 of the Basic Code.

Sec. 104.2. (S30-64).

Change section to read as follows:

104.2. Application for Permit.—It shall be unlawful to construct, enlarge, alter, remove or demolish or change the occupancy of a building from one use group to another requiring greater strength, exit or sanitary provisions; or to install or alter any equipment for which provision is made or the installation of which is regulated by the Abridged Building Code, until a building permit has been obtained by the owner or his agent. The application for a permit shall be made in writing on approved forms; and shall be accompanied by two (2) complete sets of dimensioned plans showing all habitable floors, basement, cellar, foundations and sections, and by specifications describing the kind, size, quality and grade of all construction materials and service equipment. The building official may waive the re-

quirement for filing plans when the work involved is of a minor nature and the building operation is adequately described in the application. All plans submitted for filing shall be prepared and signed as required by the statutes of the State of (name of state) Where compliance with state statutes governing building construction is required, the application shall be accompanied by a set of the plans approved by the designated authority.

Sec. 107.5. (S10-64).

Delete wording of the present section and substitute the following; add new subsection:

107.5. Unlimited Areas.—In other than frame construction, the area of all buildings of assembly (use group F-3), business, industrial, mercantile and storage use groups not including high hazard uses, which do not exceed one (1) story or eighty-five (85) feet in height shall not be limited outside the fire limits; provided the exit facilities comply with the provisions of section 108, an automatic sprinkler system is provided complying with the provisions of section 1213.19 of the Basic Code and the building is isolated as specified in section 107.51, except that a sprinkler system shall not be required for buildings of type 2 or type 3A construction used exclusively for storage of noncombustible material not packed or crated in combustible material or as exempt by section 206.2 of the Basic Code for special industrial uses.

107.51. Fire Separation.—The minimum fire separation on all sides of one-story buildings of unlimited area shall be determined by the type of construction as herein specified:

Buildings of fireproof construction.....	30 feet
Buildings of protected noncombustible construction (1½ hours)	30 feet
Buildings of protected noncombustible construction (¾ hour)	40 feet
Buildings of exterior masonry (heavy timber and protected ordinary)	40 feet
Buildings of exterior masonry (ordinary).....	50 feet
Buildings of noncombustible construction (unprotected exterior)	50 feet

Sec. 107.52. (S17-64).

Add new subsection as follows:

107.52. Unlimited Area School Buildings.—Outside the fire districts one-story school buildings of type 2 construction may be unlimited in area when a direct exit to the outside of the building is provided from each classroom and the building is equipped with an approved automatic sprinkler system throughout. A fire separation shall be provided on all sides of such buildings as specified in section 107.51.

Sec. 108.2. (S53-62-63).

Add the following new paragraph at the end of the section:

In the residential portion of motels (use group L-1) of fireproof (type 1A and 1B) protected noncombustible (type 2A and 2B) and heavy timber (type 3A) construction, not more than two (2) stories and nonhabitable attic or thirty (30) feet in height, interior enclosed stairways may be omitted where at least one (1) door from each motel unit opens onto a roofed-over open porch or balcony served by at least two (2) stairways so

located as to provide a choice of independent, unobstructed paths of exit directly to the grade. Such porches and stairways shall comply with the requirements of interior stairways (section 618.0 of the Basic Code) except as provided in section 621.1 of the Basic Code. Porches shall be not less than four and one-half (4½) feet in width. The stairways shall be not less than three (3) feet eight (8) inches in width and shall be located remotely from each other. The maximum travel distance from any motel unit to the nearest stairway shall be seventy-five (75) feet. Porches and stairways shall be located at least ten (10) feet from adjacent property lot lines and from other buildings on the same lot unless openings in such buildings are protected by three-quarter (¾) hour fire resistive doors or windows.

Sec. 108.21. (S64-62)

Add the following sentence at the end of the subsection:

Exits in dwellings shall be so arranged that they may be reached without passing through another living unit.

Sec. 108.32. (S36-63-64).

Change section to read as follows:

108.32. Location of Exitways.—Whenever more than one means of exit is required from any room, space or floor, they shall be placed as remote from each other as practicable and shall be arranged to provide direct access in separate directions from any point in the area served and within the allowable travel distances herein prescribed.

Sec. 110.62. (S18-61-62)

Delete present section and substitute the following:

110.62. Hollow and Solid Masonry and Mass Concrete.—The thickness of masonry foundation walls shall not be less than shown in the following table for the type of foundation and superstructure construction used. The combined height of eight (8) inch foundation wall and the wall supported shall not exceed thirty-five (35) feet.

THICKNESS OF FOUNDATION WALLS

<i>Foundation Wall Construction</i>		<i>Maximum Depth Below Grade (feet)</i>		
Type	Thickness (Inches)	Frame	1, 2 Masonry Veneer	Masonry
Hollow masonry	8	4 (6)	4.5 (6)	5 (7)
	10	5 (7)	5.5 (7)	6 (7)
	12	7	7	7
Solid masonry	8	5 (7)	5.5 (7)	6 (7)
	10	6 (7)	6 (7)	6.5 (7)
	12	7	7	7
Mass concrete	8	7	7	7

Note 1. Depth below grade may be increased up to those shown in parentheses where such increase is warranted by soil conditions and local experience and is required by the building official.

Note 2. Where height of unbalanced fill (height of finish grade above basement floor or inside grade) exceeds seven (7) feet, foundation wall thickness shall be determined by structural analysis as required in section 871.1 of the Basic Code,

Sec. 111.0. (S14-62 Pt. 1)

Title remains the same, delete wording and substitute the following:

The exterior walls, interior partitions, floors and roofs of light wood frame construction shall be designed and constructed to develop adequate strength to resist all vertical and lateral forces due to both dead and live loads, and as specified in this section. Standard balloon, braced, platform and post and beam types of construction conforming to the standards listed in appendix B-1 shall be considered acceptable framing methods.

Sec. 111.1. (S14-62 Pt. 2)

Delete the present section and substitute the following:

111.1. Grades and Sizes of Lumber.—Structural lumber and timber and its fastenings shall be adequately designed and assembled to safely sustain all imposed loads. When stress-grade lumber is used and properly identified and controlled, working stresses may be in accordance with the accepted engineering practice standards listed in appendix B-1. When the grade of lumber is not identified, working stresses shall be established by the building official in accordance with the principles set forth in the standards listed in appendix B-1. All lumber herein specified are nominal sizes, and the American Lumber Standards for dressed sizes shall be accepted as the corresponding minimum net dimensions. Nominal sizes may be shown on the plans, but stress computations shall be based on actual sizes. Except as herein provided for composite or built-up integrated units, or when approved after test as specified in section 105, no wood floor beam, roof beam, joist, rafter or framing timber shall be less than two (2) inches in thickness. All isolated structural posts shall have a minimum dimension of four (4) inches.

Sec. 111.2. (S14-62 Pt. 3)

Delete present section and subsections and substitute the following:

111.2. Fabrication.

111.21. Connections.—All connections shall be fabricated with approved timber connectors, bolts, lag screws, spikes, nails, gluing or other approved connecting devices designed in accordance with accepted engineering practice listed in appendix B-1. Nailed connections shall not be less than specified in the recommended nailing schedule in appendix F.

111.22. Joints in Girders.—The joints of solid or built-up beams or girders shall be made over column or pier supports when constructed as simple spans. When constructed of multiple joists as continuous girders, the joints shall be broken in adjoining joists; and all joints shall be located between one-sixth ($\frac{1}{6}$) and one-quarter ($\frac{1}{4}$) the span length from supports and shall be securely nailed or otherwise bonded together in an approved manner.

111.23. Cutting and Notching.—It shall be unlawful to notch, cut or pierce beams, joists, rafters or studs in excess of the limitations herein specified unless proved safe by structural analysis, or suitably reinforced to transmit all calculated loads. Notches in the top or bottom of joists shall not exceed one-sixth ($\frac{1}{6}$) the depth of the member and shall not be located in the middle one-third ($\frac{1}{3}$) of the span. Notches located closer to the supports than three (3) times the depth of the member shall not exceed one-fifth ($\frac{1}{5}$) the depth. Holes bored or cut into joists for

pipng or electrical cables shall not be closer than two (2) inches to the top or bottom of the joist and the diameter of the hole shall not exceed one-third ($\frac{1}{3}$) the depth of the joist. In studs of bearing walls or partitions, notches or bored holes made to receive piping, electrical conduit, air conditioning or heating duct work or for other fabricating purposes shall not be cut or bored more than one-third ($\frac{1}{3}$) the depth of the stud. When the stud is cut or bored in excess of one-third ($\frac{1}{3}$) its depth it shall be reinforced to be equal in load carrying capacity to a stud notched not more than one-third ($\frac{1}{3}$) its depth.

Delete the following subsection without substitution:

111.24. Deleted.—No requirements.

111.25. Deleted.—No requirements.

111.26. Deleted.—No requirements.

111.27. Deleted.—No requirements.

111.28. Deleted.—No requirements.

111.29. Deleted.—No requirements.

Sec. 111.3. (S14-62 Pt. 4)

Delete present section and substitute the following:

111.3. Floors and Roof Construction.

Add the following new subsections:

111.31. **Foundation Anchorage.**—When required to resist wind uplift, wall sills shall be anchored to foundation walls or piers at corners and at intermediate intervals of not more than eight (8) feet with one-half ($\frac{1}{2}$) inch bolts embedded in the masonry foundation to a depth of not less than eight (8) inches in placed concrete, and not less than fifteen (15) inches in unit masonry.

111.32. **At Grade Protection.**—All wood members, whether structural or nonload-bearing, shall be protected as provided in section 116.0 and enclosed spaces shall be ventilated as provided in section 115.0. Exposed metal siding and sheathing shall be supported on the concrete apron specified in section 116.4 or on other approved water-resistant foundation supports extending to the minimum height above grade of eight (8) inches. All posts in basements or cellars shall have concrete bases which extend not less than two (2) inches above the finished floor and bear directly on the post footing. When flooring of concrete or other approved impervious material is not provided, the concrete base shall extend not less than six (6) inches above the finished floor. Wood posts shall be installed as provided in section 116.0.

111.33. **Bearing and Anchorage on Girders.**—Floor beams framing into girders shall be anchored, tied or nailed to secure continuity. The ends of all beams or joists resting on girders shall bear not less than four (4) inches or shall be supported in approved metal stirrups or on wood clips or ribbon strips not less than two (2) by three (3) inches in size. Beams or joists

framing from opposite sides shall either lap not less than six (6) inches and be securely bolted or spiked together, or when framing end to end, all joists, beams and girders shall be secured together by approved metal ties, straps or dogs.

111.34. Plates and Ribbon Boards.—Plates which are used in exterior walls to support joists or rafters shall be double, of the same width as the supporting studs and each not less than two (2) inches thick. In non-bearing partitions, at least one (1) top and bottom plate shall be provided of the same width as the studs; and the partition shall be firestopped as required in section 119.9. Ribbon boards which support floor or roof joists shall be not less than one (1) by four (4) inches in size and shall be nailed thereto as required by the nailing schedule. Sills shall be at least the equivalent of a two (2) by six (6) inch stud.

111.35. Headers and Trimmers.—All headers more than four (4) feet in length and their trimmers shall be doubled. Headers with four (4) or more tail beams or six (6) feet or more in length shall be supported on approved metal joist hangers. When nailing is permitted, the tail and header beams shall be secured in accordance with the nailing schedule in appendix F. All tail beams or joists which are twelve (12) feet or more in length shall be hung in approved joist or beam hangers. All trimmer beams shall be spiked together.

Sec. 111.36. (\$59-62-63-64).

Change subsection to read as follows:

111.36. Bridging.—In all floor, attic and roof framing, there shall be not less than one (1) line of bridging for each eight (8) feet of span. The bridging shall consist of not less than one (1) by three (3) inch lumber, double-nailed at each end, or of equivalent metal bracing of equal rigidity. A line of bridging shall also be required at supports where adequate lateral support is not otherwise provided.

Midspan bridging is not required for floor, attic or roof framing in one- and two-family dwellings (use group L-3) where joist depth does not exceed twelve (12) inches nominal.

111.37. Multiple Joists and Rafters.—Floor joists under bearing partitions shall be doubled or formed of built-up sections or may be replaced by a solid section of adequate strength to support the load. Dormer windows and other openings in roofs shall be framed with double rafters and headers. Valley rafters on spans over twelve (12) feet, measured horizontally, shall be doubled.

111.38. Roof construction.—Roof rafters shall be vertically supported at the ridge or shall be adequately tied together or trussed to prevent spreading of the bearing walls, and in roofs having a pitch greater than three (3) in twelve (12) collar beams of not less than one (1) by six (6) inch boards shall be installed in the upper one-third ($\frac{1}{3}$) of the attic space to every third pair of rafters.

111.39. Floor Joists and Rafters.—Spans for joists and rafters determined on the basis of accepted engineering analysis or in accordance with

the standards listed in appendix B-1 or by tests in accordance with the provisions of the Basic Code shall be acceptable. Where the lumber is not identified as to species and grade and no stress value has been assigned, the spans of joists and rafters shall be as provided in table 8 of appendix D-4.

Sec. 111.4. (S14-62 Pt. 5) (S14-63 Pt. 1). (S40-64 Pt. 1).

Delete the following section and subsection and substitute the following:

111.4. Decking.—The thickness of subflooring, flooring and roof decking shall be limited by the spacing of the joists and rafters. One (1) inch wood flooring or roof decking may be supported by beams or joists at twenty-four (24) inch centers, except when approved, integrated assemblies are used. For heavier planking, the spacing, center to center of the supports, shall not be more than thirty-two (32) times the thickness of the planking, except that when reinforced with finish flooring the span of subfloor planking shall not exceed forty-eight (48) times the thickness of the planks. Subflooring is not required except where additional vertical or lateral strength and rigidity are required. Any spacing of beams and joists determined on the basis of accepted engineering analysis or tests in accordance with provisions in the Basic Code shall be acceptable.

The maximum spans of horizontal load-bearing plywood sheathing and roof decking shall be limited by the allowable stresses and deflection for the design live load, but shall have not less than the following thickness when laid parallel to the load-supporting span:

Change title and footnotes of the table to read as follows:

**PLYWOOD ROOF SHEATHING
DOUGLAS FIR, WESTERN LARCH, SOUTHERN PINE
AND
GROUP 1 SHEATHING GRADES WESTERN SOFTWOOD PLYWOOD**

(Table remains the same)

WESTERN SOFTWOOD PLYWOOD, GROUP 2 (c, d)

(Table remains the same)

Note a.—These spans shall not be exceeded for any load condition.

Note b.—Provide blocking or other suitable edge support when span exceeds twenty-eight (28) inches for one-half ($\frac{1}{2}$) inch; thirty-two (32) inches for five-eighths ($\frac{5}{8}$) inch; and thirty-six (36) inches for three-fourths ($\frac{3}{4}$) inch.

Note c.—This table applies also to all grades identified as Group 1, excepting the sheathing grades (C-D and C-C), which, if identified as Group 1, may be used as shown in upper portion of this table for Douglas fir plywood, etc.

Note d.—Provide adequate blocking or suitable edge support when span exceeds twenty-four (24) inches for one-half ($\frac{1}{2}$) inch; twenty-eight (28) inches for five-eighths ($\frac{5}{8}$) inch; and thirty-two (32) inches for three-fourths ($\frac{3}{4}$) inch.

*For special case of two-span continuous beams spans can be increased six and one-half ($6\frac{1}{2}$) per cent except as noted under (a).

111.41. **Plywood Sub-Flooring.**—Where used as structural subflooring, plywood shall be of the minimum thicknesses set forth in table below:

Sec. 111.41. (S14-63 Pt. 2). (S40-64 Pt. 2).

Change title, table and footnotes of table to read as follows:

MINIMUM THICKNESS OF PLYWOOD SUB-FLOORS
(Plywood continuous over 2 or more spans and face grain perpendicular to supports)
DOUGLAS FIR PLYWOOD, WESTERN LARCH, SOUTHERN PINE
AND
GROUP 1, SHEATHING GRADE, WESTERN
SOFTWOOD PLYWOOD

<i>Plywood Thickness</i>	<i>Maximum Support Spacing (a)</i>
$\frac{1}{2}$ " (b)	16"
$\frac{5}{8}$ " (b)	20"
$\frac{3}{4}$ " (b)	24"

WESTERN SOFTWOOD PLYWOOD, GROUP 2*

<i>Plywood Thickness</i>	<i>Maximum Support Spacing (a)</i>
$\frac{5}{8}$ " (b)	16"
$\frac{3}{4}$ " (b)	24"

Note a.—Spans shall be limited to values shown because of possible effect of concentrated loads. Allowable uniform load based on deflection of $\frac{1}{360}$ is 100 psf.

Note b.—Blocking installed at edges unless separate underlayment of one-fourth ($\frac{1}{4}$) inch minimum thickness, twenty-five thirty-seconds ($\frac{25}{32}$) inch wood strip flooring, or plywood with approved tongue and groove edges is used. If wood strips are perpendicular to supports, one-half ($\frac{1}{2}$) inch and five-eighths ($\frac{5}{8}$) inch can be used on twenty-four (24) inch span.

*This table applies also to all grades identified as Group 1, excepting the sheathing grades (C-D and C-C), which, if identified as Group 1, may be used as shown in upper portion of this table for Douglas fir plywood, etc.

111.42. Deleted.—No requirements.

111.43. Deleted.—No requirements.

111.44. Deleted.—No requirements.

111.45. Deleted.—No requirements.

Sec. 111.5. (S14-62 Pt. 6)

Delete present section and subsections and substitute the following:

111.5. Wood-Stud Frame.

111.51. Bearing Walls.—Posts and studs in bearing walls and partitions shall be designed as columns, with due allowance for lateral support furnished by sheathing, intermediate bracing, horizontal bridging, wall coverings and the floor and roof assemblies. The load-bearing value of isolated posts or struts and of frame walls and partitions shall be limited by tables 12 and 13 of appendix D-5. The walls shall be fabricated in such a manner as to provide support for the material used to enclose the building and to provide for transfer of all lateral loads to the foundation in accordance with section 804.3 of the Basic Code.

111.52. Non-Bearing Walls.—Studs in non-bearing walls and partitions shall not be spaced more than forty-eight (48) inches on centers, and may be erected with the long dimension parallel with the wall; unless otherwise approved after test as an integrated unit.

111.53. Bracing.—In buildings more than one (1) story in height and where necessary for strength on one (1) story buildings, the corner posts shall be equivalent to not less than three (3) two (2) by (4) inch studs, braced by not less than one (1) piece of one (1) by four (4) inch continuous brace let into the studs. Bracing may be omitted when diagonal wood sheathing or plywood panels are used or other sheathing specified in section 111.61 is applied vertically in panels not less than four (4) feet by eight (8) feet in area with approved nailing complying with appendix L.

111.54. Multiple Stories.—When the frame is more than one (1) story in height and studs or posts are not continuous from sill to roof, the members shall be secured together with approved clips, splices or other connections to insure continuity and a well-integrated structure. Sheet metal clamps, ties, or clips shall be formed of galvanized steel or other corrosion-resistive materials, of not less than No. 20 U.S. gage steel for two (2) inch framing members and not less than No. 18 U.S. gage in thickness for three (3) inch members. For four (4) inch and larger members, column splices and beam girder supports shall be affected with approved post caps of metal or reinforced concrete or with through-bolted corbel blocks or side bolsters.

111.55. Framing of Openings.—All window and door openings of bearing walls and partitions shall have double studs at the jambs for the full height of the opening, or other approved methods or devices shall be used to support the superimposed loads. Headers or double joists as herein specified or trusses or other approved assemblies shall be provided over all window and door openings in bearing walls and partitions.

	<i>Supporting 1 floor or roof</i>	<i>Supporting 2 floors or roofs</i>
Spans less than four (4) feet	two 2" x 4"	two 2" x 6"
Spans four (4) feet to six (6) feet	two 2" x 6"	two 2" x 8"
Spans six (6) feet to eight (8) feet	two 2" x 8"	two 2" x 10"
Spans eight (8) feet to ten (10) feet	two 2" x 10"	two 2" x 12"

Sec. 111.6. (S14-62 Pt. 7)

Delete present section and subsections and substitute the following:

111.6. Wall Sheathing and Weatherboarding.

111.61. Wall Sheathing.—Except where wood or plywood siding is approved without sheathing or when back-plastered stucco construction is used, or the stucco is furnished with a wrapping of No. 18 U.S. gage wire attached horizontally on the studs at six (6) inch intervals, all exterior frame walls shall be sheathed with one of the following materials or any other material of equal strength and durability approved by the building

official: one (1) inch reinforced cement mortar; one (1) inch wood sheathing; one-half ($\frac{1}{2}$) inch gypsum boards; one-half ($\frac{1}{2}$) inch fiber boards; or five-sixteenths ($\frac{5}{16}$) inch plywood.

All wood sheathing boards shall be nailed to each stud and to the top and bottom plates and sills as provided in the nailing schedule (appendix F).

111.62. Paper-Back Lath Sheathing.—In one- and two-family dwellings and one (1) story business buildings with brick or other masonry veneers, the sheathing may consist of a layer of approved paper-backed wire fabric of not less than No. 16 U. S. gage galvanized wire with stiffening ribs not more than five (5) inches on center, to which is attached a double layer of fibrous waterproof backing. The veneer shall be laid up with a one (1) inch intermediate space which shall be mortar filled as each course of brick is applied.

111.63. Exterior Weatherboarding, Veneers and Condensation.—To secure weathertightness in framed walls and other unoccupied spaces, the exterior walls shall be faced with an approved weather-resisting covering, properly attached to resist wind and rain. The cellular spaces shall be so ventilated as not to vitiate the fire-stopping at floor, attic and roof levels or shall be provided with interior non-corrodible vapor-type barriers complying with the approved rules; or other means shall be used to avoid condensation and leakage of moisture. The following materials shall be accepted as approved weather coverings of the nominal thickness specified:

Brick masonry veneers.....	2 inches
Stone veneers.....	2 inches
Clay tile veneers.....	$\frac{1}{4}$ to 1 inch
Stucco or exterior plaster.....	$\frac{3}{4}$ inch
Precast stone facing.....	$\frac{5}{8}$ inch
Wood siding (without sheathing).....	$\frac{5}{8}$ inch
Wood siding (with sheathing).....	$\frac{1}{2}$ inch
Exterior plywood (without sheathing).....	See below
Exterior plywood (with sheathing).....	$\frac{5}{16}$ inch
Asbestos shingles.....	$\frac{5}{32}$ inch
Asbestos cement boards.....	$\frac{1}{8}$ inch
Aluminum clapboard siding.....	.024 inch
Formed steel siding.....	28 gage

Exterior plywood may be applied directly to framing as a siding, provided it has a nominal thickness of three-eighths ($\frac{3}{8}$) inch. Joints shall occur over framing members, unless wood or plywood sheathing is used or joints are lapped horizontally a minimum of one and one-half ($1\frac{1}{2}$) inches or otherwise made waterproof to the satisfaction of the building official. If plywood is used as lapped siding without sheathing, the wall framing to which it is attached shall be diagonally braced.

111.64. Exterior Stucco.—All stucco work shall be reinforced with approved metal lath or wire fabric as herein specified; except when applied directly to a masonry base, or when installed on a masonry base which is protected with bituminous surfacing. The reinforcing fabric shall be coated with zinc or other approved rust-resistive coating, or shall be manufactured from corrosion-resistive alloys.

<i>Type of Reinforcement</i>	<i>Minimum U.S. gage</i>	<i>Maximum Mesh inches</i>	<i>Minimum Weight Pounds per Square Yard</i>
Metal lath	—	—	3.4
Expanded metal	—	—	1.8
Woven wire	18	1	1.74
Woven wire	17	1½	1.41
Woven wire	16	2	1.47
Welded wire	18	4 sq. in.	0.67
Welded wire	17	4 sq. in.	0.82
Welded wire	16	4 sq. in.	1.10

When applied over approved sheathing, a covering of fourteen (14) pound waterproof felt or paper should first be attached to the sheathing. In back-plastered stucco with the stucco extending not less than five-eighths ($\frac{5}{8}$) inch back between the studs, the waterproof paper backing may be omitted. All metal reinforcement shall be furred away from sheathing or building paper not less than one-fourth ($\frac{1}{4}$) inch with self-furring lath, metal strips or approved furring nails. When applied directly to masonry or monolithic concrete, the surfaces shall be roughened, hacked or bush-hammered to provide bond or a preparatory dash coat of portland cement grout shall be applied and kept damp for at least two (2) days after application and before applying succeeding stucco coats. At all times during application and for a period of not less than forty-eight (48) hours after application of each coat, provision shall be made to keep stucco work above fifty (50) degrees F. Stucco shall be kept a sufficient height above ground surfaces as provided in section 111.69 and all sills, coping and projecting courses shall be flashed and provided with drips to avoid water damage.

111.65. Masonry Veneers.—Veneer of unit masonry on wood framing shall be securely attached to the wood frame with corrosion-resistive anchors at vertical intervals of not more than sixteen (16) inches and horizontal intervals of not more than twenty (20) inches; except clay tile, one-quarter ($\frac{1}{4}$) to one (1) inch in thickness, when bonded to a three-quarter ($\frac{3}{4}$) inch reinforced cement mortar base as provided in section 112.27. Fourteen (14) pound waterproof felt or paper shall be attached securely to the frame back of the veneer and flashing as required in section 111.7 shall be provided where necessary to prevent moisture penetration behind the veneers. The average height of the four (4) inch brick veneer construction shall be not more than twenty-five (25) feet above its supports on the foundation wall or on corbels of masonry or steel and two (2) inch stone veneers shall not exceed a height of eighteen (18) feet. The corbel shall project not more than two (2) inches from the face of the foundation wall as specified in section 110.6.

Sec. 111.66. (S55-62-63-64).

Add the following new paragraphs to this section:

Metal veneers on all buildings shall be made electrically continuous by bonding together each course when applied horizontally, and each strip of panel when applied vertically.

Electrical continuity between horizontally applied courses of metal veneer shall be assured by bonding each course at all inner and outer corners with a conductor having no greater resistance than the grounding conductor used for grounding the electrical system within the building on which such veneer is applied. All conductors grounding such veneer shall be joined together and attached in an approved manner to the same grounding electrode used to ground the electrical system in the building.

Vertically applied metal veneer shall be bonded together at the lower edge of each strip of panel. The bonding conductor shall have no greater resistance than the conductor used to ground the electrical system within the building on which such metal veneer is applied and shall be extended to and attached in an approved manner to the grounding electrode used to ground the electrical system within the building.

In cases where metal veneer is to be applied on a building with no electrical wiring system, grounding shall be by one of the methods outlined in Article 250 of the National Electrical Code, if deemed necessary by the building official. Whether a building is or is not wired, no grounding of metal veneer shall be concealed until the installation has first been inspected and approved by the building official. Alternate methods of grounding metal veneer may be used provided they are at least equal in performance to the methods prescribed herein, and further provided that such desired method is first submitted to and approved by the building official.

111.67. Nailing Weather Boarding, Wall and Roof Coverings.—All weather boarding and wall and roof coverings shall be securely nailed with aluminum, copper, zinc, zinc coated or other approved corrosion-resistive nails into the supporting structure in accordance with the recommended nailing schedule or the approved manufacturer's standards. Shingles and other weather coverings attached to sheathing less than one (1) inch thick, except plywood five-sixteenths ($\frac{5}{16}$) inch thick, shall be secured with approved mechanically-bonding nails or by standard shingle nails appropriate for type of shingles in furring strips securely nailed to studs. Wood shingles or shakes attached with approved corrosion-resistive annular grooved nails may be applied over fiberboard shingle backer and fiberboard sheathing when the installation is in accordance with the approved manufacturer's standards listed in appendix C. Wood shingles or shakes and asbestos shingles or siding may be nailed directly to nail base fiberboard sheathing not less than one-half ($\frac{1}{2}$) inch nominal thickness with approved corrosion-resistive annular grooved nails when the installation is in accordance with the approved manufacturer's standards listed in appendix C.

111.68. Deleted.—No requirements.

111.69. Deleted.—No requirements.

Sec. 111.7. (S-14-62 Pt. 8)

Delete present section and substitute the following:

111.7. Plywood Construction.—All plywood when used structurally shall meet the performance standards and all other requirements of the applicable U.S. commercial standard listed in appendix B for the type, grade, and species of plywood involved and shall be so identified by an approved

agency. Working stresses shall conform to the standards of accepted engineering practice as listed in appendixes A and B.

Add new subsections as follows:

111.71. Integrated Assemblies.—Approved panels or other integrated assemblies fabricated of dimension lumber with wood stress-coverings glued thereto or consisting of structural units of metal-covered or molded plywood, or other approved plastics, formed and molded into prefabricated load-bearing members shall be permitted for use in floors, roofs, walls, partitions and ceilings when designed in accordance with accepted engineering practice or meeting the test requirements of section 105 of this code. All structural members shall be so connected at their junction to provide a well-integrated structure with tight weatherproof joints where exposed to the weather. The fastenings of stressed panel coverings to longitudinal or transverse structural studs or ribs shall provide rigidity equivalent to approved gluing. Nailing shall not be acceptable for this purpose. The glues shall be handled, mixed and applied in accordance with the manufacturer's specifications and the timber construction standards listed in appendix B. The glues shall be handled, mixed and applied by approved fabricators in accordance with the manufacturer's specifications. For general interior uses or for exterior use protected against the weather, group 1 glues shall be used, including among others, casein glue with mold-resistant preservative, urea-resin glue, phenol or phenol-resorcinol resin glue or their approved equivalent. For exterior use with full exposure to the weather, or for interior use when subjected to high humidity, group 2 glue shall be used, including among others, resorcinol-resin, phenol-resin or melamine resin glues or their approved equivalent.

111.72. Spacing of Vertical Studs.—Maximum stud spacing for bearing wall and partition sheathing and for use in stress-skin panels or other prefabricated constructions shall be determined by accepted engineering analysis or by the tests prescribed for prefabricated assemblies. For average materials, the vertical loads shall not exceed the limits specified in table 13, appendix D-5. When stress-grade materials are used, the stresses and design shall conform to accepted engineering practice.

Sec. 111.8. (S14-62 Pt. 9)

Change title to read as follows and delete subsection and substitute the following:

111.8. Protection of Surfaces.

111.81. Flashing.—All exterior openings shall be constructed with approved corrosion-resistive flashings at top and sides or by other approved method to be leakproof. Similar flashings shall be installed at the intersection of chimneys or other masonry construction with frame or stucco walls and as required in veneer construction in section 111.64. Such flashings shall be provided with projecting lips on both sides under stucco copings; under and at the ends of masonry, wood or metal copings and sills; at wall and roof intersections; under built-in gutters; at junction of chimneys and roofs; at wall and roof intersections; and in all roof valleys and around all roof openings.

Sec. 112.16. (S15-61-62 Pt. 2)

Change the thickness requirement and wording for Aluminum in the table:

Aluminum clapboard siding..... .024 inch

Sec. 112.17. (S51-62 Pt. 1)

Change section to read as follows:

112.17. Anchorage of Veneers.—Four (4) inch ashlar facing shall be bonded as required in section 112.35. Thin stone, tile and terra cotta veneers three (3) inches or less in thickness shall be frostproof and not more than two hundred and eighty-eight (288) square inches in area when subject to frost action and when not so exposed, the tile may be increased a maximum of fifty (50) percent in area and shall be anchored with corrosion-resistive anchors as provided for unbonded ashlar. Veneers one (1) inch in thickness or less of stone, ceramic or porcelain tiles or terra cotta shall be set in accordance with the applicable standards listed in appendix B-1.

Sec. 112.27 (S8-61 Pt. 1- Pt. 2).

Delete the following subsection, title and wording. Add new subsection as follows:

112.27. Dry-set Portland Cement Mortars.—Dry-set Portland Cement Mortar to be used in the installation of ceramic tile shall be in accordance with standard specification for dry-set portland cement mortar listed in Appendix B.

Sec. 113.3. (S22-61 Pt. 1). (S35-61-62 Pt. 2)

Change item 1 of this section to read as follows:

1—Incinerators, see note a.

Note a.—Metal pipe not less than No. 20 U.S. standard gage galvanized steel or other equivalent noncombustible corrosion resistant material may be used for venting incinerators installed in locations such as open sheds, breezeways, or carports, provided the metal pipe is exposed and readily examinable for its full length and suitable clearances are maintained.

Add the following:

5—Oil-fired appliances and equipment except as exempted in section 113.5.

Sec. 113.43. (S22-61 Pt. 1).

Change subsection to read as follows:

113.43. Gas Vent or Chimney Termination.—The gas vent or chimney should extend high enough above the building or other neighboring obstructions so that wind from any direction will not create a positive pressure in the vicinity of the gas vent or chimney termination. Gas vents shall extend at least two (2) feet and chimneys shall extend at least three (3) feet above the highest point where they pass through a roof of a building and at least two (2) feet higher than any portion of a building within ten (10) feet except as provided in section 113.46.

Sec. 113.5. (S-35-61-62 Pt. 3)

Change the first sentence to read as follows:

113.5. Vents for Gas-Fired Equipment.—For the purpose of determining vent requirements gas-fired and oil-fired appliances shall be classified as “listed” or “unlisted”.

Sec. 113.52. (S22-61 Pt. 3).

Add the following to the list in this section:

9—Specialized equipment of limited input such as laboratory burners or gas lights.

Sec. 113.54. (S22-61 Pt. 4).

Change last sentence of the first paragraph to read as follows:

Gas vents shall extend at least two (2) feet and chimneys shall extend at least three (3) feet above the highest point where they pass through a roof of a building and at least two (2) feet higher than any portion of a building within ten (10) feet; provided the following conditions are met:

Sec. 113.63. (S35-61 Pt. 4).

Add the following:

Type L low-temperature venting systems shall be used only with fuel burning appliances listed as exhausting low-temperature combustion products containing a minimum of excess air and listed for use with Type L low-temperature vent systems. Type L low-temperature vent systems shall be installed in accordance with the terms of their listing and the manufacturer's instructions.

Sec. 113.65. (S22-61 Pt. 5).

Change the first paragraph of this subsection to read as follows:

113.65. Clearances and Protection.—No gas-appliance vent shall pass through an attic, concealed space, combustible floor or roof, wall or partition unless constructed as herein provided. Such vents shall be fitted with a ventilating collar or double thimble with the annular space filled with approved noncombustible insulating material. A clearance of not less than one (1) inch shall be maintained from all combustible construction when plastered and not less than two (2) inches when unplastered. All vents shall be enclosed in one-quarter ($\frac{1}{4}$) inch asbestos or three-eighths ($\frac{3}{8}$) inch gypsum boards where they pass through habitable spaces.

Sec. 113.7. (S22-61 Pt. 6).

Change section to read as follows:

113.7. Chimney Connectors.—Chimney connectors shall be constructed of galvanized steel or other approved and noncombustible, corrosion-resistant material having a melt point of two thousand (2000) degrees F. No tile pipe shall be used as chimney connector.

Sec. 114.42. (S66-62)

Add the following sentence at the end of the section:

The use of oil or coal fired space heaters as the main heating system in residential buildings is prohibited.

Sec. 114.33. (S15-63).

Delete subsection without substitution:

114.33. Deleted.—No requirements.

Sec. 114.42. (S66-62-63).

Add the following at the end of the section:

The installation or use of unlisted electric room heaters is prohibited. The installation or use of unlisted or unvented gas, oil or other fuel burning room heaters is prohibited.

Sec. 115.14. (S38-63).

Add new subsection as follows:

115.14. Basements and Cellars.—Except as may be otherwise specified for habitable or occupiable rooms, the glass window area in basements and cellars, except crawl spaces as provided in section 115.4 shall be not less than one-fiftieth ($\frac{1}{50}$) of the floor area served, and provisions shall be made for fresh air supply prescribed for specific uses in section 115.0 and table 19.

Sec. 117.1. (S34-64 Pt. 1).

Change first paragraph to read as follows:

117.1. Standard of Accepted Engineering Practice.—The design and installation of plumbing systems, including sanitary and storm drainage, sanitary facilities, water supplies and storm water and sewage disposal in buildings shall comply with the following sections: 117.5 through 117.9 and accepted engineering practice as defined in the National Plumbing Code listed in appendix B-1 and that plastic pipe and fittings meeting the standards in appendix B-1 may be used in the following application:

a. Drain, Waste and Vent

Sec. 117.77. (S24-61).

Change Table 28 to read as follows and add new Table 28A.

TABLE 28.—AVERAGE DIMENSIONS OF COPPER WATER TUBE

Water tube standard size	Outside diameter in inches	Wall thickness in inches		
		Type K	Type L	Type M
$\frac{3}{8}$	0.500	0.049	0.035	0.025
$\frac{1}{2}$	0.625	0.049	0.040	0.028
$\frac{3}{4}$	0.750	0.049	0.042	—
$\frac{7}{8}$	0.875	0.065	0.045	0.032
1.....	1.125	0.065	0.050	0.035
$1\frac{1}{4}$	1.375	0.055	0.055	0.042
$1\frac{1}{2}$	1.625	0.072	0.060	0.049
2.....	2.125	0.083	0.070	0.058
$2\frac{1}{2}$	2.625	0.095	0.080	0.065
3.....	3.125	0.109	0.090	0.072
$3\frac{1}{2}$	3.625	0.120	0.100	0.083
4.....	4.125	0.134	0.110	0.095
5.....	5.125	0.160	0.125	0.109
6.....	6.125	0.192	0.140	0.122

TABLE 28.A—COPPER DRAINAGE TUBE DWV DIMENSIONS AND WEIGHTS

Nominal Size	Actual Outside Diam. (in inches)	Average Outside Diam. Tolerances (in inches)	Nominal Wall Thickness (in inches)	Wall Thickness Tolerance (in inches)	Theoretical Weight (in pounds per foot)
1¼	1.375	.0015	.040	.0035	.650
1½	1.625	.002	.042	.0035	.890
2	2.125	.002	.042	.004	1.07
3	3.125	.002	.045	.004	1.69
4	4.125	.002	.058	.007	2.87
5	5.125	.002	.072	.008	4.43
6	6.125	.002	.083	.008	6.10

All tolerances plus and minus

Sec. 118.6. (S31-63).

Add new subsection as follows:

118.63. Ventilation Duct Outlets.—Ventilation ducts from all range hoods including residential exhaust fans shall discharge to the outside atmosphere.

Secs. 119.54 & 119.55. (S57-62-63-64 Pts. 1 & 2).

Add the following new subsections:

119.54. Grounding of Metal Roofs.—Whenever, because of hazard resulting from electrical equipment or apparatus located thereon, or because of proximity to power lines, or for any other reason, it is deemed necessary by the building official, metal roofs shall be grounded by bonding together each course or strip and the bonding conductor or conductors shall be extended to and attached in an approved manner to the grounding electrode used to ground the electrical system within the building on which such metal roofing is applied. The conductors used to bond courses or strips or metal roofing together, or any conductor extended for grounding to the grounding electrode, shall have no greater resistance than the conductor used to ground the electrical system within the building.

119.55. Alternate Methods of Grounding Metal Roofing.—Alternate methods of grounding metal roofing may be used provided they are at least equal in performance to the methods prescribed herein, and further provided that such desired method is first submitted to and approved by the building official.

Sec. 119.6. (S57-62-63-64 Pt. 3).

Add the following sentence at the end of this section:

When the metal roofing is used, it shall be grounded as required in sections 119.54 and 119.55.

Sec. 119.91. (S15-62)

Change section to read as follows:

119.91. Wood Stud Walls.—All wood stud walls and partitions shall be firestopped at each floor level and between the ceiling of the top story and the roof space. When such spaces are required to be ventilated as prescribed in sections 111.8 and 115.3, the details of firestopping shall be approved by the building official.

APPENDIX A

ACCREDITED AUTHORITATIVE AGENCIES

(S2-61 Pt. 3). (S28-61 Pt. 1). (S43-62 Pt. 1) (S51-62 Pt. 2) (S61-62)
(S24-64) (S32-64) (E2-64) (E4-64) (E6-64).

Add the following Accredited Authoritative Agencies:

AHA	American Hardboard Association 20 North Wacker Drive, Chicago 6, Illinois
APA	American Plywood Association 119 A Street, Tacoma 2, Washington
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers 345 East 47th Street, New York 17, New York
HPMA	Hardwood Plywood Manufacturers Association 2310 S. Walter Reed Drive, Arlington 6, Virginia
IIA	Incinerator Institute of America 420 Lexington Avenue, New York 17, New York
MHMA	Mobile Homes Manufacturers Association 20 North Wacker Drive, Chicago 6, Illinois
NOFI	National Oil Fuel Institute, Inc. 60 East 42nd Street, New York 17, New York
OSU	The Ohio State University, Engineering Experiment Station, 156 West 19th Avenue, Columbus 10, Ohio
SPI	The Society of the Plastics Industry, Inc. 250 Park Avenue, New York 17, New York

-Change listings to read as follows:

ARI	Air-Conditioning and Refrigeration Institute 1815 North Fort Myer Drive, Arlington, Virginia
AWPI	American Wood Preservers Institute 1707 L Street, NW, Washington, D.C. 20036
DFPA	American Plywood Association Division For Product Approval 119 A Street, Tacoma 2, Washington
FTI	Facing Tile Institute 1520 18th Street, NW, Washington 6, D.C.
GA	Gypsum Association 201 North Wells Street, Chicago 6, Illinois
IAEI	International Association of Electrical Inspectors 201 E. Erie, Chicago 22, Illinois
ICBO	International Conference of Building Officials 50 South Los Robles, Pasadena, California
IES	Illuminating Engineers Society 1860 Broadway, New York 23, New York
MIA	Marble Institute of America, Inc. 32 South Fifth Avenue, Mount Vernon, New York
NCMA	National Concrete Masonry Association 1015 Wisconsin Avenue, NW, Washington 7, D.C.
NESA	National Electric Sign Association 10912 South Western Avenue, Chicago 12, Illinois
NLMA	National Lumber Manufacturers Association 1619 Massachusetts Avenue, NW, Washington 6, D.C.
PFS	Plywood Fabricator Service, Inc., an affiliate of the American Plywood Association 14741 Oakley, Harvey, Illinois

-Delete the following listings:

ASHAE	American Society of Heating and Air-Conditioning Engineers, 29 West 39th Street, New York 18, New York
ASRE	American Society of Refrigerating Engineers 40 West 40th Street, New York 18, New York
BPI	Building Products Institute Shoreham Building—Room 1032, Washington 5, D.C.
HPI	Hardwood Plywood Institute P.O. Box 6246, Shirlington Station, Arlington, Virginia

APPENDIX B-1

ACCEPTED ENGINEERING PRACTICE STANDARDS

(S2-61 Pt. 4). (S8-61 Pt. 3). (33-61). (S37-61 Pt. 1). (S24-62)
(S45-62) (S47-62 Pt. 2) (S51-62 Pt. 3) (S71-62 Pt. 1)
(S7-63) (S12-63) (S17-63) (S23-63 Pts. 1-2). (S28-63-64)
(S14-64) (S26-64) (S34-64 Pt. 2) (S36-64) (S40-64 Pt. 3).

CONCRETE

—Change the date of the following standard

Reinforced Concrete—Standard Requirements forACI 318—1963

ELECTRICAL ILLUMINATION

—Change the date of the following standard

Electrical Code—National.....NFPA No. 70—1962

EQUIPMENT

Add the following standards:

Heating

Oil Burning Equipment.....NFPA 31—1961

Incinerators

Incinerator StandardsIIA-1960

Unclassified—Miscellaneous

Mobile Home Standards for Plumbing, Heating, and

Electrical SystemsMHMA—1959

Travel Trailer Standards for Electrical, Plumbing, Heating

and LP-Gas Consuming Appliances Systems.....MHMA—1960

Change standards to read as follows:

Plumbing and Piping (Gas or Water)

National Plumbing Code (including modification herein).....USDC DCS 28-1951

GLASS

Add the following new listings:

Safety Glazing Materials for Glazing Motor Vehicles

Operating on Land Highways, Safety Code for.....ASA Z26.1—1950

—Fully-Tempered.....No. 8, ASA Z26.1—1950

—Laminated.....Nos. 4, 9 and 12, ASA Z26.1—1950

—WiredNo. 11, ASA Z26.1—1950

INTERIOR FINISHES

—Change listing to read as follows:

Gypsum Plastering—Specifications for.....Gypsum Association

Vermiculite Plastering and Vermiculite Acoustical Plastic

for Sound Conditioning—Standard Specifications for.....VI—1963

Add the following new standards:

Tile, Glazed Ceramic Wall, Installed in Portland Cement Mortar.....ASA A 108.1—1958

Tile, Ceramic Mosaic, Installed in Portland Cement Mortar.....ASA A 108.2—1958

Tile, Ceramic, Installed in Dry-set Portland Cement Mortar.....ASA A 108.5—1960

Tile, Quarry, and Pavers, Installed in Portland Cement Mortar.....ASA A 108.3—1958

MASONRY

Add the following new standards:

Marble, Exterior Thin Veneer—Specifications forASA A 94.2—1961

Marble, Exterior Thin, in Curtain or Panel Walls—Specifications for...ASA A 94.3—1961

Marble, Interior—Specifications for(See INTERIOR FINISHES)

METALS

Aluminum

Change title of standard to read as follows:

Aluminum Construction, Manual, Section A—Specifications for

Structures of Aluminum AlloysAA—1963

Add new standard as follows:

Aluminum Construction, ManualAA—1959

STEEL

Change the date of the following standards:

Design, Fabrication and Erection of Structural Steel for
Buildings—Specifications forAISC—1963
—High Strength Steel Bolts—Specifications for Assembly
of Structural Joints UsingAISC—1962

Add the following standard:

—Architectural Exposed Structural Steel
Specifications forAISC—1960

Delete the following standards:

Plastic Design and Fabrication—Supplemental Rules forAISC—1958
Supplementary Provisions Governing Use of ASTI-A36 Steel.....AISC—1960

Change subtitle to read as follows:

Steel Joist, Open Web

Change standard to read as follows:

Steel Joist Construction, Open Web—Long Span or LA Series—
Standard Specifications forAISC-SJI—1961

Add the following standards:

—J Series, Standard SpecificationsSJI May 30—1961
—H Series, Standard SpecificationsSJI May 31—1963
—Longspan or LH Series, Standard Specifications.....SJI—AISC—June 21—1962

Change the date of the following standards:

—Design ManualAISI—1962
—Structural Members—Specifications for the Design ofAISI—1962

Delete the following standards:

—Long Span Series—Standard Specifications for.....SJI—1953
—Short Span Series—Standard Specifications for.....SJI—1955 ASA A87.1—1957

WOOD AND WOOD PRODUCTS

Change the date of the following standards:

Plywood Beams—Specification for Design and Fabrication of.....DFPA Spec.
No. BB8—1963
Plywood-Lumber Structural Assemblies—Specifications for Design of....DFPA Spec.
No. 1—1964
Plywood Panels, Curved—Specifications for Design of.....DFPA Spec.
No. CP-8—1963
Stress Grade Lumber and Its Fastenings—National Design
Specifications forNLMA—1926
Timber Construction StandardsAITC 100—1962

Add the following new standards:

Plywood Panels—Flat with Stressed Covers—Specifications
for Design and Fabrication of.....DFPA Spec.
No. SS-8—1963
Plywood Folded Plates—Specifications for Fabrication of.....DFPA Spec.
No. FP-62—1962

APPENDIX B-2

FIRE TEST AND FLAME SPREAD TEST STANDARDS (S26-61).

COMBUSTIBLE OR NONCOMBUSTIBLE PROPERTIES

Add the following standard:

Fire-Retardant Treatments of Building Materials.....NFPA 703T— 60

APPENDIX C

MATERIAL STANDARDS

(S8-61 Pt. 3). (S37-61 Pt. 2). (S3-62). (S17-62 Pt. 4) (S47-62 Pt. 1)
(S71-62 Pt. 2). (S25-63) (S42-63) (S4-64) (S24-64 Pt. 2) (S26-64 Pt. 2)
(S40-64 Pt. 4).

MASONRY

Add the following standard:

Dry-set Portland Cement Mortar..... ASA A 118.1—1959

METAL

— Change standard to read as follows:

High Strength Steel Bolts for Structural Steel Joints,
Including Suitable Nuts and Plain Hardened Washers—
Specifications forASTM A 325—63T

— Change the dates of the following standards:

Bolt Steel, Low-Carbon, Standard Fasteners—Specifications for...ASTM A 307—63T
Castings, Mild-to-Medium Strength Carbon Steel for
General Application—Specifications forASTM A 27—62
Forgings, Alloy Steel for General Industrial Use—
Specifications forASTM A 237—63T
Forgings, Carbon Steel for General Industrial Use—
Specifications forASTM A 235—63T
Quenched and Tempered Alloy Steel Bolts and Studs with
Suitable Nuts—Specifications for.....ASTM A 354—63T
Steel for Bridges and Buildings—Specifications for.....ASTM A 7—61T
Steel Castings for Structural Purposes, High Strength—
Specifications forASTM A 36—62T
Structural Steel, High Strength—Specifications for.....ASTM A 440—63T
Structural Steel, High Strength Low Alloy—Specifications for...ASTM A 242—63T
Structural Steel, High Strength Low Alloy Manganese Vanadium—
Specifications forASTM A 441—63T

Delete the following standard:

Nickel Steel, Structural—Specifications for.....ASTM A 8—54

Add the following new standards:

Quenched and Tempered Steel Bolts and Studs with Suitable
Nuts and Plain Hardened Washers.....ASTM A 325—58T
Rivet Steel, Structural, High Strength Alloy.....ASTM A 406—59T
Steel for Bridges and Buildings—Specifications for.....ASTM A 7—58T
Structural Steel—Specifications forASTM A 36—60T
Structural Steel for Welding—Specifications for.....ASTM A 373—58T
Structural Steel, High Strength —Specifications for.....ASTM A 440—59T
Structural Steel, High Strength Low Alloy Manganese Vanadium...ASTM A 441—60T

Aluminum-Alloy Bars, Rods and Wire—Standard Specifications for..	ASTM B211—62
Aluminum-Alloy Die Forgings—Standard Specifications for.....	ASTM B247—61
Aluminum-Alloy Drawn Seamless Tubes—Standard Specifications for	ASTM B210—62
Aluminum-Alloy Extruded Bars, Rods and Shapes—Standard Specifications for	ASTM B221—62
Aluminum-Alloy Extruded Tubes—Standard Specifications for.....	ASTM B235—62
Aluminum-Alloy Pipe—Standard Specifications for.....	ASTM B241—62
Aluminum-Alloy Rivet and Cold Heading Wire and Rods—Standard Specifications for	ASTM B316—61
Aluminum-Alloy Round Welded Tubes—Standard Specifications for.	ASTM B313—62
Aluminum-Alloy Sheet and Plate—Standard Specifications for.....	ASTM B209—62
Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded—Standard Specifications for	ASTM B308—62
Aluminum-Base Alloy Die Castings—Standard Specifications for.....	ASTM B85—60
Aluminum-Base Alloy Permanent Mold Castings—Tentative Specifications for	ASTM B108—62T
Aluminum-Base Alloy Sand Castings—Tentative Specifications for...	ASTM B26—62T
Aluminum and Aluminum-Alloy Welding Rods and Bare Electrodes—Tentative Specifications for	ASTM B285—61T

PLUMBING AND PIPING

—Add new standards as follows:

Copper Drainage Tube (DWV)ASTM B 306—59

Plastic Pipe

—Plastic Pipe and Fittings.....USDC TS 5607
(Drain, Waste and Vent).....USDC TS 5608

Change the date of the following standard:

Steel Pipe

—Welded and Seamless—Specifications for.....ASTM A 53—62T

ROOFING AND SIDING

Add the following standard:

Fiber Insulation Board, Structural—

—Manufacturers Standards for Insulating Roof Deck.....IBI Spec. No. 1—60

—Manufacturers Standards for Fiberboard Nail-Base Sheathing....IBI Spec. No. 2—61

WOOD AND WOOD PRODUCTS

Change the date of the following standards:

—Structural Glued Laminated Douglas Fir (Coast Region)

Lumber—DesignWCLA—60

—FabricationWCLA—60

—Structural Glued Laminated West Coast Hemlock Lumber—

DesignWCLA—60

FabricationWCLA—60

—Structural Glued Laminated Southern Pine, Design and Fabrication of.....SPA—60

Add the following new standards:

Determining Design Stresses for Load-Sharing Lumber

MembersASTM D 2018—62T

Fire-Retardant Treated Wood (treatment method).....AWPA C1—59

Hardboard, Commercial Standard for.....USDC CS 251—63

Method for Establishing Structural Grades of Lumber.....ASTM D 245—62T

Plywood, Southern Pine—Commercial Standard for.....USDC CS 259—63

—Structural Glued Laminated TimberUSDC CS253—63

Inspection ManualAITC 200—63

Add the following references and note:

Appendix E-1

TABLE 5.—FIRE-RESISTANCE RATINGS OF STRUCTURAL ELEMENTS IN HOURS

STRUCTURAL ELEMENT		TYPE OF CONSTRUCTION										
		TYPE 1		TYPE 2			TYPE 3			TYPE 4		
		FIREPROOF		NONCOMBUSTIBLE		Note b	EXTERIOR MASONRY WALLS		FRAME			
		PROTECTED	UNPROTECTED	PROTECTED	UNPROTECTED		PROTECTED	UNPROTECTED	PROTECTED	UNPROTECTED		
		1A	1B	2A	2B	2C	3A	3B	3C	4A	4B	
1	EXTERIOR WALLS											
	On Street Lot Lines or with Fire Separation of 30' or More from Interior Lot Lines or Any Building	4	3	2	¾	0	2	2	2	½	0	
	Non-Bearing	0	0	0	0	0	0	0	0	½	0	
	Bearing	4	3	2	1½	¾	2	2	2	¾	¾	
	Non-Bearing	2	2	1½	¾	¾	2	2	2	¾	¾	
	Bearing	4	3	2	¾	0	2	2	2	½	0	
	Non-Bearing	2	2	1½	¾	0	2	2	2	½	0	
	Bearing	4	3	2	¾	0	2	2	2	½	0	
	Non-Bearing	1½	1½	¾	¾	0	See Sec. 217	1½	1½	½	0	
	Interior Bearing Walls and Partitions	4	3	Noncombustible	¾	0	2	¾	0	½	0	
2	Fire Walls	4	3	2	2	2	2	2	2	2	2	
	Fire Divisions			In No Case Less Than Fire Grading of Use Group—(See Table 16)								
3	Fire Enclosure of Exitways, Elevator Hoistways, Public Hallways and Stairways	2	2	2	2	2	Noncombustible			¾	¾	
	Shafts Other Than Stairways	2	2	2	2	2	Noncombustible			¾	¾	
4	Corridor Partitions & Vertical Separation of Tenant Spaces	¾	¾	Noncombustible	¾	NOTE J	¾	¾	0	½	0	
	Other Non-Bearing Partitions (See Art. 9)			Noncombustible	Noncombustible	NOTE J	0	0	0	0	0	
5	Columns, Girders, Trusses, (Other Than Roof Trusses) and Framing	3	2	1½	¾	0	See Sec. 217	¾	0	½	0	
	Supporting One Floor	4	3	2	¾	0	See Sec. 217	¾	0	½	0	
6	Supporting More Than One Floor											
	Structural Members Supporting Wall			Required Fire Resistance of Wall Supported But Not Less Than Fire Resistance Rating for Type of Construction								
7	Floor Construction Including Beams—15' or Less in Height	3	2	1½	¾	0	See Sec. 217	¾	0	½	0	
	More than 15' But Less Than 20' in Height to Lowest Member	2	1½	¾	¾	0	See Sec. 217	¾	0	½	0	
8	Roof Trusses and Framing Including Arches and Roof Deck	¾	¾	¾	¾	0	See Sec. 217	0	0	½	0	
	20' or More in Height to Lowest Member	0	0	¾	¾	0	See Sec. 217	0	0	0	0	
9	Roof Trusses and Framing Including Arches and Roof Deck											
	20' or More in Height to Lowest Member											

Note (j) — Fire-Retardant Treated Wood, complying with section 903.72, may be used as provided in section 903.8.

Appendix E-2

TABLE 6.—GENERAL HEIGHT AND AREA LIMITATIONS OF ONE-STORY BUILDINGS
FACING ON ONE STREET OR PUBLIC SPACE NOT LESS THAN 30 FEET WIDE

Notes a, d and 1

Areas in square feet, heights in number of stories and feet

N.P. — NOT PERMITTED
UNLIMITED

USE GROUP		TYPE OF CONSTRUCTION											
		TYPE 1		TYPE 2				TYPE 3				TYPE 4	
		Fireproof	Noncombustible	Protected		Un-protected	(H.T.) Mill	Ordinary Masonry Walls		Protected	Un-protected		
1A	1B			2A	2B			3A	3B			3C	4A
A	HIGH HAZARD	Notes h. and m.	5St. 65' 16,800	3St. 40' 14,400	3St. 40' 9,600	2St. 30' 7,200	1St. 20' 4,800	2St. 30' 7,200	2St. 30' 6,000	1St. 20' 4,800	1St. 20' 3,600	N.P.	
B-1	STORAGE—Moderate	Notes b, d, e, f, i, and j.			5St. 65' 16,800	4St. 50' 12,600	2St. 30' 8,400	4St. 50' 12,600	3St. 40' 10,500	2St. 30' 8,400	2St. 30' 6,300	1St. 20' 4,200	
B-2	STORAGE—Low	Notes b, d, e, and f.			7St. 85' 28,800	5St. 65' 21,600	3St. 40' 14,400	5St. 65' 21,600	4St. 50' 18,000	3St. 40' 14,400	3St. 40' 10,800	2St. 30' 7,200	
C	MERCANTILE	Notes b, d, e, and f.			6St. 75' 19,200	4St. 50' 14,400	2St. 30' 9,600	4St. 50' 14,400	3St. 40' 12,000	2St. 30' 9,600	2St. 30' 7,200	1St. 20' 4,800	
D	INDUSTRIAL	Notes b, d, e, and f.			6St. 75' 19,200	4St. 50' 14,000	2St. 30' 9,600	4St. 50' 14,400	3St. 40' 12,000	2St. 30' 9,600	2St. 30' 7,200	1St. 20' 4,800	
E	BUSINESS	Notes b, d, e, and f.			7St. 85' 28,800	5St. 65' 21,600	3St. 40' 14,400	5St. 65' 21,600	4St. 50' 18,000	3St. 40' 14,400	3St. 40' 10,800	2St. 30' 7,200	
F-1-A	ASSEMBLY THEATRES (Motion Picture Theatres)	With stage and scenery	6St. 75' 14,400	4St. 50' 9,600	2St. 30' 7,200	1St. 20' 4,800	2St. 30' 6,000	1St. 20' 4,800	1St. 20' 3,600	N.P.			
F-1-B		Without stage	5St. 65' 16,800	3St. 40' 12,600	2St. 30' 8,400	3St. 40' 12,600	2St. 30' 10,500	1St. 20' 8,400	1St. 20' 6,300	1St. 20' 4,200			
F-2	ASSEMBLY—Night Clubs and similar uses		4St. 50' 7,200	3St. 40' 4,800	2St. 30' 3,600	1St. 20' 2,400	2St. 30' 3,000	1St. 20' 2,400	1St. 20' 1,800	1St. 20' 1,200			
F-3	ASSEMBLY—Lecture Halls, Recreation Centers, Terminals—Restaurants other than Night Clubs	Note e	5St. 65' 16,800	3St. 40' 12,600	2St. 30' 8,400	3St. 40' 12,600	2St. 30' 10,500	1St. 20' 8,400	1St. 20' 6,300	1St. 20' 4,200			
F-4	ASSEMBLY—Schools	Note n	5St. 65' 28,800	3St. 40' 21,600	2St. 30' 14,400	3St. 40' 21,600	2St. 30' 18,000	1St. 20' 14,400	1St. 20' 10,800	1St. 20' 7,200	1St. 20' 4,800	Note g	
H-1	INSTITUTIONAL—Restrained		6St. 75' 18,000	4St. 50' 12,000	2St. 30' 9,000	2St. 30' 9,000	2St. 30' 7,500	1St. 20' 6,000	1St. 20' 4,500	N.P.			
H-2	INSTITUTIONAL—Incapacitated		8St. 90' 21,600	4St. 50' 14,400	2St. 30' 10,800	2St. 30' 10,800	2St. 30' 9,000	1St. 20' 7,200	1St. 20' 5,400	N.P.			
L-1	RESIDENTIAL—Hotels		9St. 100' 19,200	4St. 50' 14,400	2St. 30' 9,600	4St. 50' 14,400	3St. 40' 12,000	2St. 30' 9,600	2St. 30' 7,200	1St. 20' 4,800			
L-2	RESIDENTIAL—Multi-Family		9St. 100' 19,200	4St. 50' 14,400	2St. 30' 9,600	4St. 50' 14,400	3St. 40' 12,000	2St. 30' 9,600	2St. 30' 7,200	1St. 20' 4,800			
L-3	RESIDENTIAL—1 & 2 Family		19,200	4St. 50' 14,400	2St. 30' 9,600	4St. 50' 14,400	3St. 40' 12,000	2St. 30' 9,600	2St. 30' 7,200	1St. 20' 4,800			
M	MISCELLANEOUS & TEMPORARY												

Appendix E-2. Table 6.

— Change Note n. to read as follows:

Note n.—The tabular area of one-story school buildings of use group F-4 may be increased two hundred (200) per cent provided every classroom has at least one door opening directly to the exterior of the building. Not less than one-half ($\frac{1}{2}$) of the required exits from any assembly room included in such buildings shall also open directly to the exterior of the building.

— Add new note as follows:

Note o.—For exception to area limitations for one-story school buildings of type 2A and 2B construction, see section 309.11.

Appendix F. (S16-62) (S33-63).

Change to read as follows:

APPENDIX F.—Recommended Nailing Schedule

Building Element	Nail Type	Number & Distribution
Stud to sole plate	Common-toe-nail	4—8d
Stud to cap plate	Common-toe-nail	2—16d
Double studs	Common-direct	10d 12" o.c. or 16d 24" o.c.
Corner studs	Common-direct	16d 24" o.c.
Sole plate to joist or blocking	Common	16d 16" o.c.
Double cap plate.	Common-direct	16d 16" o.c.
Cap plate laps	Common-direct	2—16d
Ribbon strip—6" or less	Common-direct	2—10d each bearing
Ribbon strip—over 6"	Common-direct	3—10d each bearing
Roof rafter to plate	Common-toe-nail	3—8d
Roof rafter to ridge	Common-toe-nail	2—16d
Jack rafter to hip	Common-toe-nail	3—10d
Floor joists to studs	Common-direct	5—10d or 3—16d
(no ceiling joist)		
Floor joists to studs	Common-direct	2—10d
(with ceiling joists)		
Floor joists to sill or girder	Common-toe-nail	3—8d
Ledger strip	Common-direct	3—16d at each joist
Ceiling joists to plate	Common-toe-nail	3—16d
Ceiling joists to parallel rafters	Common-direct	3—16d
Ceiling joists (laps over partition)	Common-direct	3—16d
Collar beam	Common-direct	3—10d
Bridging to joists	Common-direct	2—8d each end
Diagonal brace (to stud & plate)	Common-direct	2—8d each bearing
Tail beams to headers (when nailing permitted)	Common-end	1—20d each 4 sq. ft. floor area
Header beams to trimmers (when nailing permitted)	Common-end	1—20d each 8 sq. ft. floor area
1" Sub-flooring (6" or less)	Common-direct	2—8d each joist
1" Sub-flooring (8" or more)	Common-direct	3—8d each joist
2" Sub-flooring	Common-direct	2—16d each joist
1" Wall sheathing (8" or less in width) ..	Common-direct	2—8d each stud
1" Wall sheathing (over 8" in width)	Common-direct	3—8d each stud
Plywood Roof and Wall Sheathing		
$\frac{1}{2}$ " or less	Common-direct	6d—6" o.c. edges and 12" o.c. intermediate
$\frac{3}{8}$ " or greater	Common-direct	8d—6" o.c. edges and 12" o.c. intermediate
$\frac{5}{16}$ ", $\frac{3}{8}$ ", $\frac{1}{2}$ "	16 ga. galvanized wire staples. $\frac{3}{8}$ " minimum crown. Length of 1" plus plywood thickness	4" o.c. edges and 8" o.c. intermediate
$\frac{3}{8}$ "		2 $\frac{1}{2}$ " o.c. edges and 5" o.c. intermediate

<i>Building Element</i>	<i>Nail Type</i>	<i>Number & Distribution</i>
Plywood Subflooring		
1/2"	Common-direct	6d—6" o.c. edges and 10" o.c. intermediate
5/8", 3/4"	Common-direct	8d—6" o.c. edges and 10" o.c. intermediate
1", 1 1/8"	Common-direct	10d or 8d ring shank— 6" o.c. edges and 6" o.c. intermediate
1/2"	16 ga. galvanized	4" o.c. edges
5/8"	wire staples. 3/8" minimum crown. 1 3/8" length	7" o.c. intermediate
1" Roof decking (6" or less in width)....	Common-direct	2 1/2" o.c. edges and 4" o.c. intermediate
1" Roof decking (over 6" in width).....	Common-direct	
Built-up girders and beams.....	Common-direct	2—8d each rafter
Continuous header to stud.....	Common-toe-nail	3—8d each rafter
Continuous header—two pieces	Common-direct	20d at 32" o.c.
1/2" Fiberboard sheathing	1 1/2" Galvanized Roofing Nail 6d Common Nail 16 gage staple, 1 1/8" long with minimum crown of 7/16"	4—8d 16d at 16" o.c.
25/32" Fiberboard sheathing	1 3/4" Galvanized Roofing Nail 8d Common Nail 16 gage staple, 1 1/2" long with minimum crown of 7/16"	3" o.c. exterior edge 6" o.c. intermediate
Gypsum sheathing	12 gage 1 1/4" Large head Corrosion-resistive	3" o.c. exterior edge 6" o.c. intermediate
Shingles—wood	Corrosion-resistive	4" o.c. on edge 8" o.c. intermediate
Weather boarding	Corrosion-resistive	2—No. 14 B&S each bearing 2—8d each bearing

Shingle nails shall penetrate not less than 3/4 inch into nailing strips, sheathing or supporting construction except as otherwise provided in section 855.51.



